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# REVIEW OF FACULTY OF ENGINEERING

## *Analecta Technica Szegedinensia*

UNIVERSITY OF SZEGED
UNIVERSITAS SCIENTIARUM SZEGEDIENSIS
FACULTY OF ENGINEERING


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# INVESTIGATION ON THE **TEXTURE OF CREAM CHEESE WITH DIFFERENT METHODS**

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## ABSTRACT

Rheological characterization of cheeses, especially processed cheeses is very important, because the quality is determined mainly by the texture properties, and the technology and the storage conditions have significant impact on the required texture. Rheological and texture properties are mainly affected by the chemical composition and the type and quantity of the processing conditions. After production the structure is going through of major changes during cooling period and the storage, so a description of knowledge well-defined circumstances, using the parameters may provide useful additional information to the qualification. The structure formation of the final product is also useful feed-back information for the manufacturer.
Different type the Sole-Mizo Co. produced processed cheeses (nature and ham flavoured) were investigated by sensory and rheological methods (texture analyses and flow behaviour). The gross composition and the quality according to the sensory test met with the requirements, their quality were located in good and excellent category. The texture of samples was studied by Texture Analyser QTS 25. The nature cheeses were investigated in the total shelf-life according to a programme, the ham flavoured samples only during a shorter period. We determined the hardness value dependence versus shelf-life. The hardness can be a useful parameter in the qualification of cream cheese. The flow behaviour of ham favoured samples was investigated by viscometer at different temperature. The apparent viscosity changed with the temperature. Flow curves showed a same character as the typical non-Newtonian pseudo plastic fluids. It was created a consistency index (as a rheological parameter) and its changes can be associated whit with temperature induced changes in the structure of processed cheeses.

## 1. INTRODUCTION

Processed cheese products are characterized essentially by special raw materials and technology. They have versatile forms, appearance and taste with very long shelf-life. Rheological characterization of cheese in general and particularly of processed cheese is important as a means of determining body and texture for quality and identity as well as a means of studying its structure as a function of composition, processing techniques and storage conditions (Konstance & Holsinger, 1992). The texture of processed cheese is affected by many factors. These include the quality of the raw cheese to be processed, emulsifying salts, water, temperature, agitation, duration of processing, addition of dairy or non-dairy ingredients, etc (Caric & Kalab, 1993; Chambre & Daurelles, 2000).
The objective of the present work was to study the textural and viscoelastic properties of cream cheeses - produced by SOLE-MIZO holding - in the shelf life of the products. The aim of investigating textural properties was to get data about the texture parameters, to get information on their changes and choose those parameters, which can give more information about the quality of the product. The aim of the investigation of the flowing properties of the product during heat treatment by rotational viscometer was to collect data to optimize the processing conditions, and to characterize the product. The grading of the samples was by chemical composition and by the quantitative descriptive test of the Hungarian Standard.

We would like to inform you the results of the two series of experiment that investigated the texture and the flowing properties of cream cheese during storage.

In the *first series of experiment* the textural parameters of nature cream cheese were determined by texture analyzer QTS-25 in the shelf life of the product, according to a program (9 times). At the same time the product was qualified according to the sensory test (MSZ 12288-1989).
In the *second series of experiment* we applied the results of the first study. The texture and flow properties were investigated on samples of hammy cream cheese in seven days after production according to a program. At the same time the product was graded according to the sensory test (MSZ 12288-1989).

## 2. MATERIALS AND METHODS

Two types of cream cheese samples (nature and hammy) were purchased from SOLE-MIZO Dairy Company. The nature samples were taken from 3-3 mixture of two different production lots. The hammy samples were taken from 3 mixture of one production lot.

### *Determination of textural parameters*

The textural parameters were determined with a QTS 25 Texture Profile Analyzer (CNS Farnell England). The samples were analyzed 5 times on the different part of it. From each product three pieces were analyzed. 15 parallel measurements were made for each product at the same age.

*Testing parameters:* Probe: 7 mm ∅ metal cylinder; Type of test: penetration; Speed of probe: 30 mm/min; Trigger: 5.0 g; Depth of penetration: 5.00 mm; Number of cycles: 1; Temperature of sample: 15±1°C. *Mechanical parameters investigated.* Fracture Force, Hardness, Modulus, Adhesive Force, Adhesiveness, Area, Work Done to Hardness.
*Texture analyses of nature samples:* The samples were analysed 9 times after production ( on the 1., 3., 5., 12., 26., 56.,86., 116., 130. days) in the self-life of the product.
*Texture analyses of hammy samples:* The samples were analysed 5 times after production in the first week of the storage (on the 1., 2., 3., 6., 7. days).

### *Determination of viscosity with rotational viscosimeter*

The flowing properties of hammy cream cheese samples were investigated the next day after production with Haake R6 rotational viscosimeter. The viscosity was determined as a function of shear rate at different temperature according to a program in three parallel measurements. *Testing parameters:* Spindle: R7; Rate of shear: 5, 10, 20, 30, 50, 60 rpm; temperature of the sample:35°C, 65°C, 75°C, 85°C. Determined parameter: Viscosity mPas.

### *Sensory Test*

The quantitative descriptive test of the Hungarian Standard (MSZ 12288-1989) (20 scores, with weighted factors) was applied for the samples. The nature samples were analyzed on the 5th, 12th, 56th, 116th and 130th day of storage, as the self-life of the products relatively long, 120 days. The hammy samples were analyzed on the 7th day after production.

## 3. RESULTS AND DISCUSSION

### *Grading the samples*

The gross composition of the samples (fat-, dry-matter, fat in the dry matter content, pH value) was determined by the factory. The composition of the samples was uniform. All data fulfilled the approval requirements (table 1).

**Table 1. Gross composition of the samples**

| **Component** | Fat content m/m% | Dry matter m/m% | pH | Fat in the dry matter m/m% |
|---|---|---|---|---|
| ***Average ± deviation*** | *24.13±0.25* | *43.4±0.35* | *5.73±0.05* | *55.59±0.72* |
| **Standard value** | 23-25 | 43-46 | 5.6-5.8 | 53-59 |

The sensory tests were evaluated according to the standard (MSZ 12292-87). The nature samples met the requirements. They had good and excellent quality in the total shelf-life. The grade of the hammy samples had excellent quality.

***Evaluation of Textural Parameters***

The texture parameters of processed cheese were determined with a penetration test by QTS 25 Texture Analyzer. Seven parameters were investigated: Fracture Force, Hardness, Modulus, Adhesive Force, Adhesiveness, Area, Work Done to Hardness. According to Cock (1994) a parameter is reproducible if average variation coefficient is smaller than 40%. Six parameters, except Fracture Force, fit to this category with variation coefficients between 20 and 35%. The selected parameters correlated significantly with hardness. We chose it as well defined, easily interpretable parameter. The hardness and the age of the samples are correlated with each other according to an exponential function. So the hardness (Y) and the logarithm of the age (X) have connection with a linear equation. At nature samples Y= 13.5 Ln(X) + 91.28 / r = 0.977 /. At hammy: Y= 315 Ln(X) + 201.71 / r = 0.960 / .

***Evaluation of viscosity***

The viscosity of hammy samples was determined with rotational viscosimeter to get information about the flow properties. The apparent viscosity ($\eta$) is changing with the speed of spindle, which correlates with the gradient of shear rate ($d\gamma/dt$).

The apparent viscosity is decreasing with the increase of shear rate. An exponential function can fit for the measured data. As the temperature increases, the rate of viscosity decrease is growing. The observation is based on the composition of the processed cheese (protein, fat, wet and emulsifying salts). The unfolded hydrated protein molecules have random orientation and reduced mobility, resulting to highly viscous solutions. These solutions display pseudoplastic flow properties, which indicate that their viscosity decreases as soon as the shear rate increases. This behavior can be explained by the progressive rotation and orientation of the macromolecules in the direction of flow (Damodaran, 1997). Increasing moisture content and temperature (thermal energy) increases the protein molecules mobility for rotation, thus the solutions exhibit less shear dependent behavior. A linear function was established between the logarithm of apparent viscosity and the logarithm of shear rate. log Y=b*log x+log a Where Y= apparent viscosity, x= shear rate. The data of linear regressions of different product mixtures are in the Table 2.

**Table 2. Parameters of linear regression (log apparent viscosity versus log shear rate)**

| ***Temperature*** | **t**=35°C | | | **t**=65°C | | |
|---|---|---|---|---|---|---|
| **Mixture** | **b** | **log a** | **R2** | **b** | **log a** | **R2** |
| 1 | *0.8757* | *1.8016* | *0.9934* | *0.8616* | *1.7702* | *0.9996* |
| 2 | *0.7928* | *3.0425* | *0.8143* | *0.7459* | *2.9224* | *0.997* |
| 3 | *1.0762* | *3.2192* | *0.9969* | *0.842* | *2.9952* | *0.993* |
| ***Temperature*** | **t**=75°C | | | **t**=85°C | | |
| **Mixture** | **b** | **log a** | **R2** | **b** | **log a** | **R2** |
| 1 | *0.8097* | *1.6396* | *0.9993* | *0.8846* | *1.5756* | *0.9998* |
| 2 | *0.7314* | *2.7962* | *0.9993* | *0.6321* | *2.718* | *0.9867* |
| 3 | *0.7337* | *2.746* | *0.9329* | *0.8741* | *2.6676* | *0.9982* |

According to Dimitreli & Thomareis (2004) the value of *log a* depends on the composition of cheese (protein and wet content) and the temperature. This parameter (*a*) is related to the consistency of cheese (consistency index). When the temperature and moisture content are increased, consistency index is reduced indicating that processed cheese is less viscous. The selected parameter (*log a*) has a relationship with the temperature by linear regression (fig. 1). The tendency is similar to that of Dimitreli & Thomareis (2004)

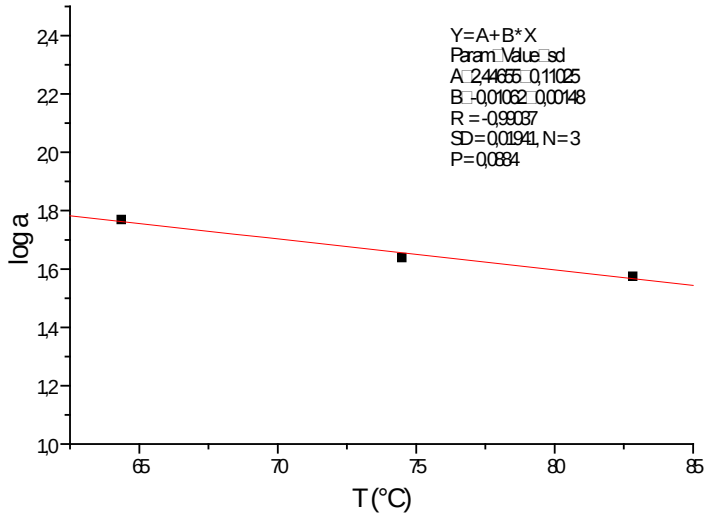


**Fig. 1. : Log a as a function m of temperature, linear regression (1. mixture)**

## 4. CONCLUSIONS

The hardness value determined by Texture Analyses and the relationship with the age of the product can be useful information to the description or qualification of the product. The apparent viscosity as a function of temperature of the processed cheese is characteristic for the pseudoplastic fluid. The consistency index was found from the evaluation of flow curves. It is related with the composition and rheological properties of the samples.

## REFERENCES


1. Caric, M., & Kalab, M. (1993). Processed cheese products. In P. F.Fox (Ed.), Cheese: chemistry, physic and microbiology (Vol. 2, pp 467–505). London: Chapman & Hall.
2. Chambre, M., & Daurelles, J. (2000). Processed cheese. In A. Eck, & J.C. Gillis (Eds.), Cheesemaking: from science to quality assurance (pp. 641–657). Lavoisier Publishing Inc.
3. Cock, P (1994): Starch compositions texture- design of pasta cocktail snacks. *Food Ingredients europe '94,* Conference Proceedings, pp. 101- 105
4. Damodaran, S. (1997). Food proteins: an overview. In S. Damodaran & A. Paraf (Eds.), Food proteins and their applications (pp. 1–24). New York, Basel, Hong Kong: Marcel Dekker, Inc.
5. Dimitreli, G. & Thomareis, A.S. (2004): Effect of temperature and chemical composition on processed cheese apparent viscosity *Journal of Food Engineering* 64, 265–271.
6. Konstance, R. P., & Holsinger, V. H. (1992). Development of rheological test methods for cheese. *Food Technology*, 46(1), 105–109.
7. MSZ 12292- 87 (1987) „Sensory Analyses of Milk and Milk product" Standard
8. MSZ 12288-1989 (1989) „Processed Cheese" Standard

# COMPLEX STRUCTURAL ANALYSIS OF CORNERED SHAPE WATER CHAMBERS OF HEAVY-DUTY BOILER

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## ABSTRACT

The Technical Institute of Faculty of Engineering of Szeged University received task to make a stress and construction analysis of a heavy-duty boilers fed by straw bales. Its documentation for manufacturing was purchased as a license from abroad. Main features of the construction and load of boilers are the followings:

- Its material: welding constructional steel;
- Large sized constructions;
- Cornered shape combustion and water chamber put into each other;
- The combustion and water chamber are covered by plate steel;
- Their stiffness are given by weld beams outside;
- Test pressure: 1 bar.

Solid Edge finite element method was used by authors to solve the problem. Regarding to the complexity of the construction the walls of the water chamber were analyzed separately. Results obtained by using the program were checked by different model investigations.

## 1. INTRODUCTION

The task is actually stress and construction controlling of a heavy-duty boilers fed by straw bales, taking into account the oversizing or undersizing of the combustion and water chamber. With other words: would it be possible to reach significant economy in material of the construction of the boiler. At the beginning of the analysis the construction seemed to be in some points under- in other points oversized. The sketch of the water chamber can be seen in Fig.1, the main dimensions of the back and side wall in Fig.2-3.

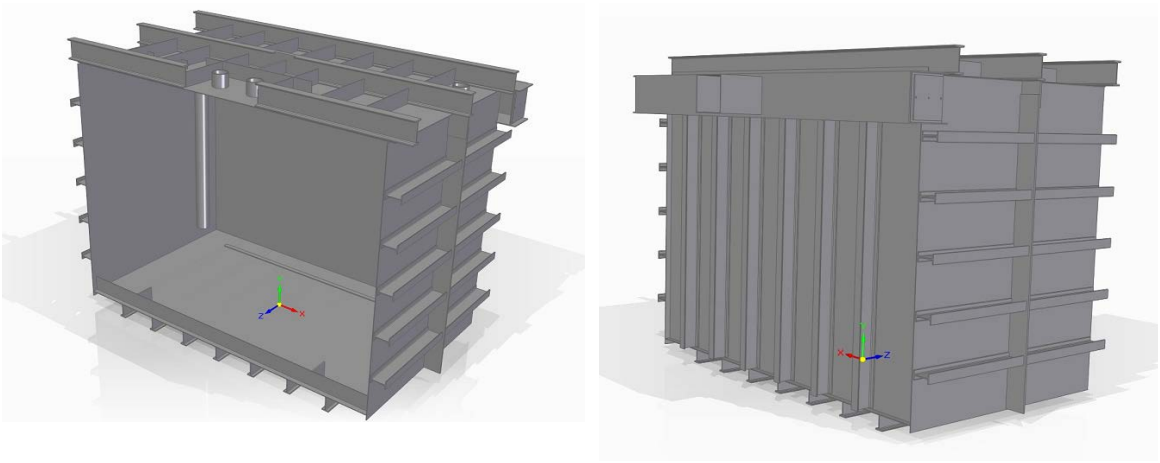

**Fig. 1. Sketch of the water chamber in front and rear view**

The stress analysis focused to the water chamber because the thickness of the wall of the combustion chamber was much more due to the heating load moreover its bracing was similar. We wanted to design a water chamber which corresponds to the load caused by test pressure 1 bar.

From this point of view the back and side walls of the water chamber are critical ones (Fig.2-3). The manufacturer realized some discontinuities along the vertical edges of the water chamber.

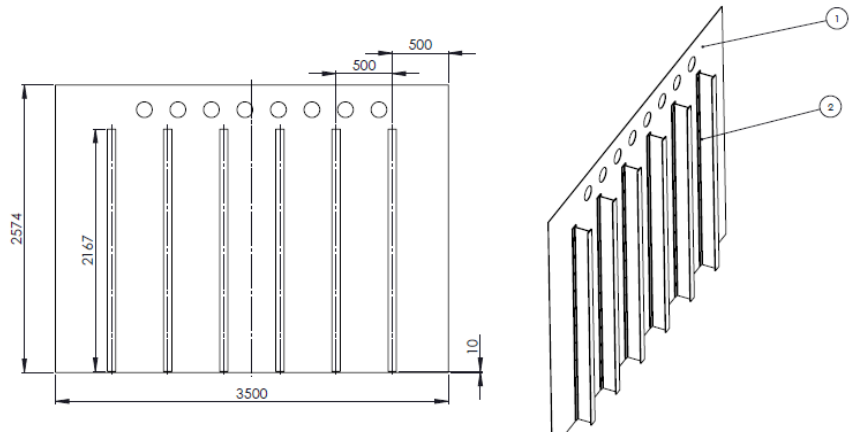


**Fig. 2. Back part of the water chamber**

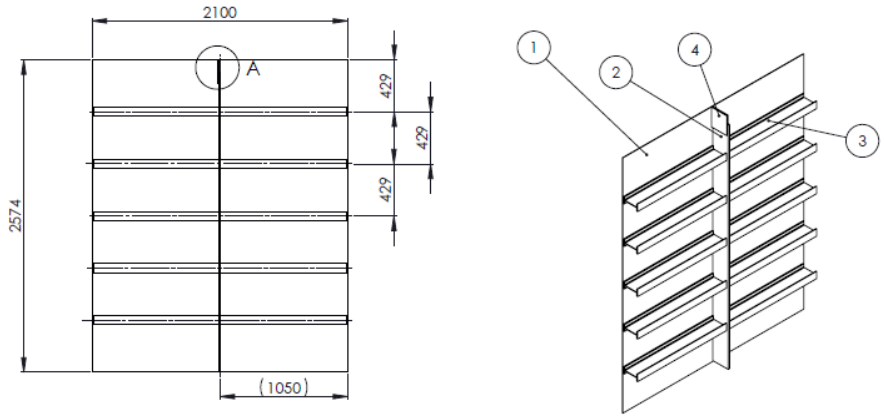


**Fig. 3. Left side of the water chamber**

For solving of the task Solid Edge finite element software were used. This program is applied for solution of similar problems. According to the designers of the software it is important to compare the results of the simulation with practical experiences and/or results of different tests.

## 2. THE APPLIED TESTMODEL

Since the shape of water chamber of the boiler is quite difficult, the application of traditional mechanical methods is limited. The program was tested by a simple mechanical model (Fig.4). The closed frame at its top and bottom is open. Main dimensions: 400x400x200 mm, wall thickness 5 mm. The walls of the frame are loaded inside by pressure of 1 bar. In Fig.4 the stress on the surface in different color and the enlarged deformation can be seen.

The ends of walls are blocked. Their moment curve in Fig.5 can be seen. The maximum values of stress can be observed at the ends of walls and at the edges of spatial model. It is in accordance with the shape of moment curve. In this case the results obtained by application of traditional mechanical methods and finite element analysis (stress and deformation) are scarcely the same ($\sigma_{max}$=312 MPa).

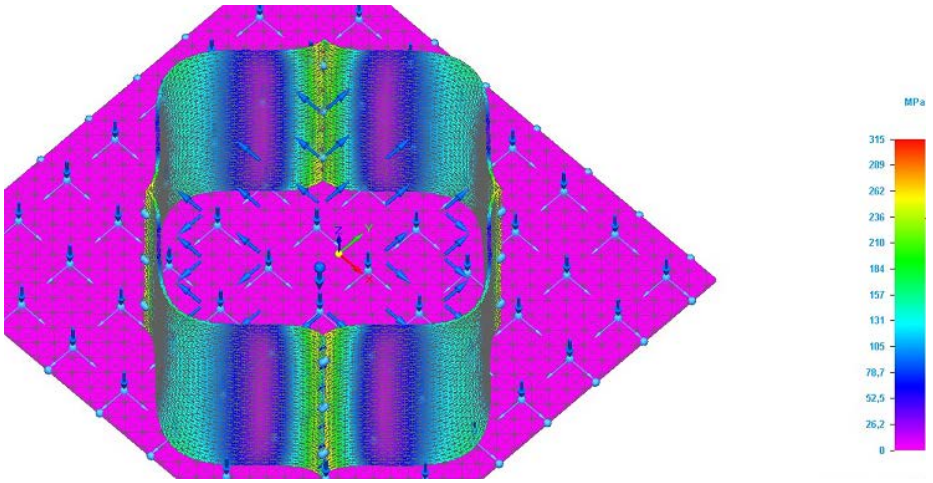


**Fig. 4. Deformation and stress on the surface of the analyzed model**

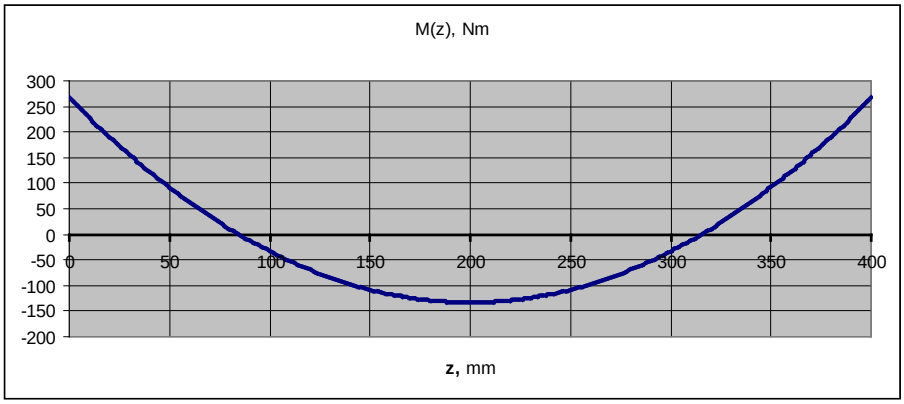


**Fig. 5. Typical moment curve of the wall of the model**

## 3. ANALYSIS OF MAIN ELEMENTS OF THE WATER CHAMBER

The controlling of main elements of the open water chamber (Fig.1) consists of the stress analysis of five plates. The critical parts of the construction are the back and side walls for this reason their results will be demonstrated (Fig. 6-10).

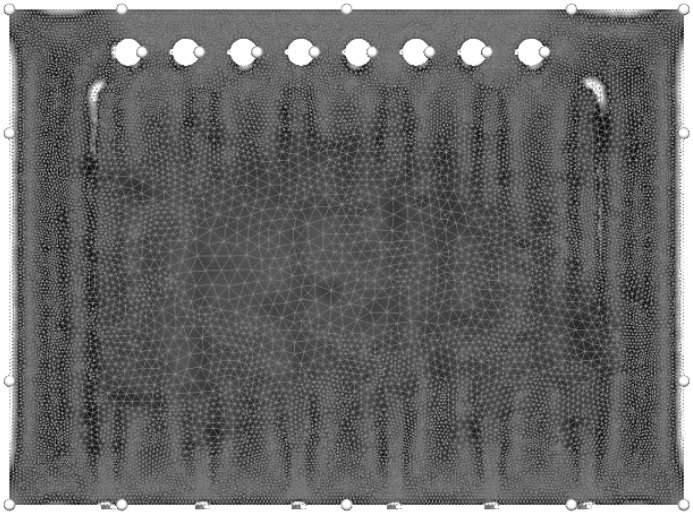

**Fig. 6. Stresses on the surface of the back part of the water chamber (edges light blue color, moreover stress concentration corners)**

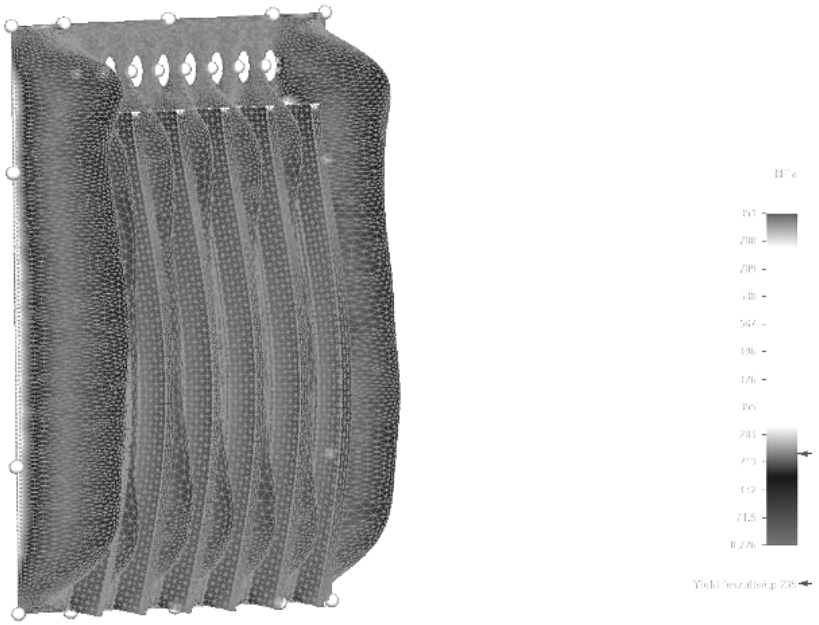

**Fig. 7. Stresses on the surface of the back part of the water chamber (rotated position)**

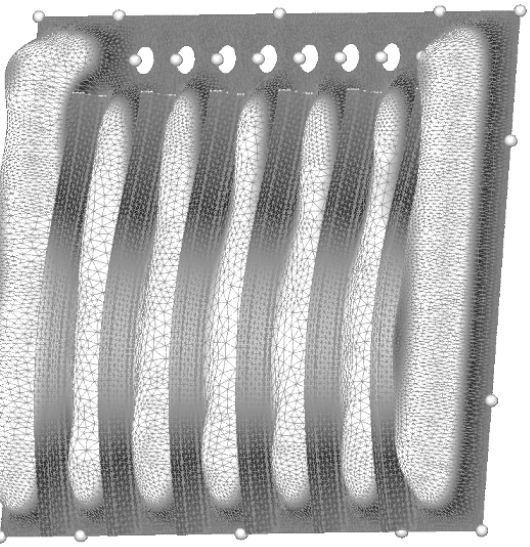

**Fig. 8. Deformation of the back part of the water chamber (enlarged demonstration)**

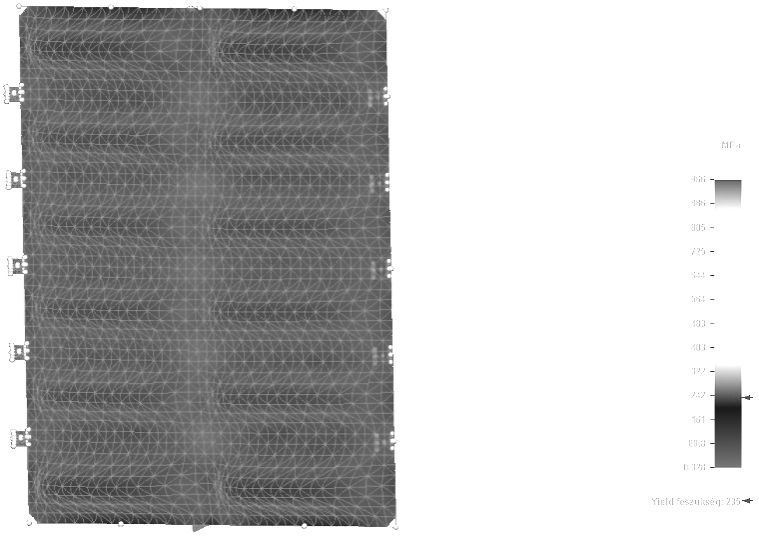

**Fig. 9. Stresses on the surface of left side of the water chamber**

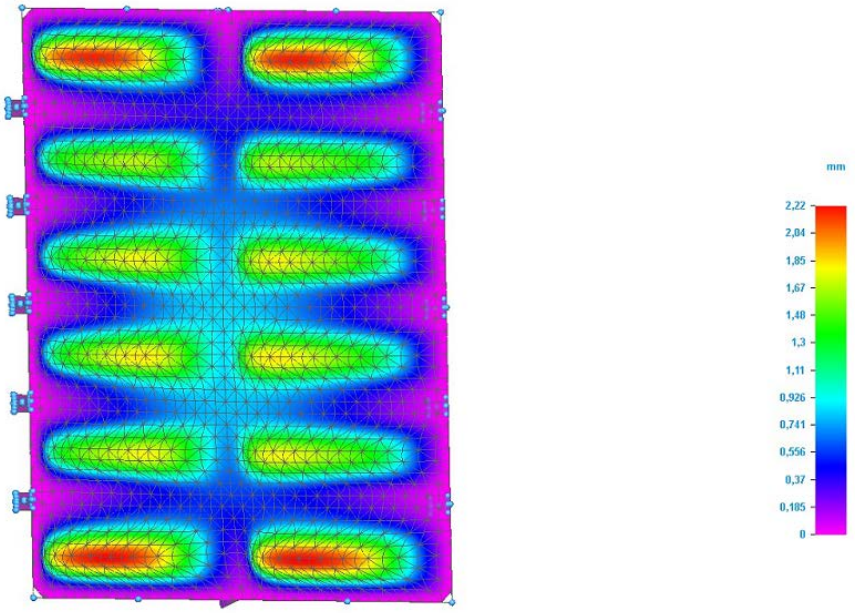


**Fig. 10. Deformation on left side of the water chamber**

By the aid of the program the walls of the water chamber can be analyzed particularly. Effects of adjacent parts on each other were taken into consideration as rigidly fastened end cross-sections. On the basis of figures and data it is observable excepting the stress concentration effect of corners the stress peaks are under the yield point of the applied steel. It was a special question the application of long and short bracing beams.

## 4. SOME QUESTIONS OF BRACING OF THE BLADES

In case of application square shaped walls the length of bracing beams and their moment curves are the same. In Fig.11-12 the bracing beams can be seen. The ratio between their lengths is 1:2. In Fig. 13 the moment curves of the beams can be seen.

Two different constraint conditions were analyzed. There are quite big differences between the load of long and short beams in maximum value of moment. The pressure on blade surface: 1 bar.

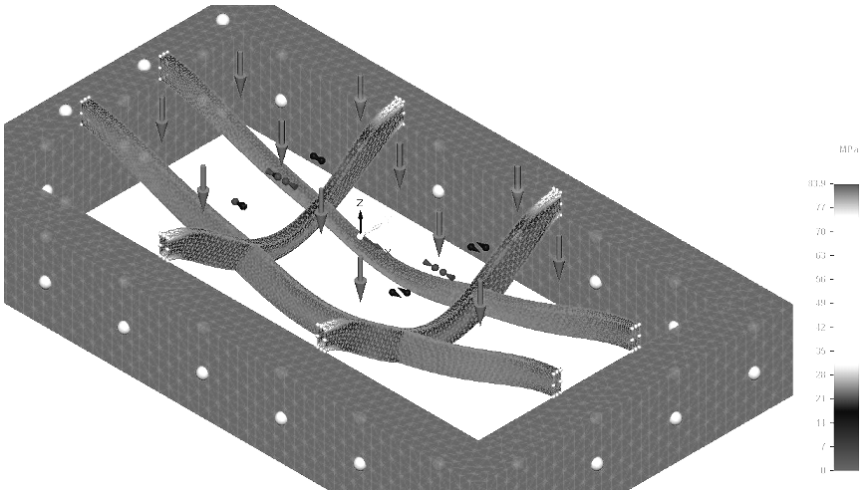

**Fig. 11. Bracing by 2 + 2 beams, end cross sections fixed**

In the figures it can be seen that at a ratio 1:2 the load of long beams is much less than the load of short beams for this reason their role in the construction is unfounded. This is the explanation of missing of long beams in case of similar constructions.

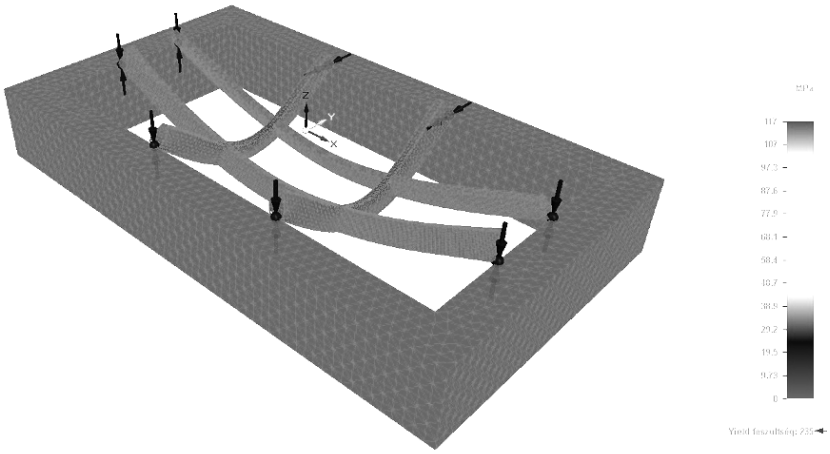

**Fig. 12. Bracing by 2 + 2 beams, at their end hinges**

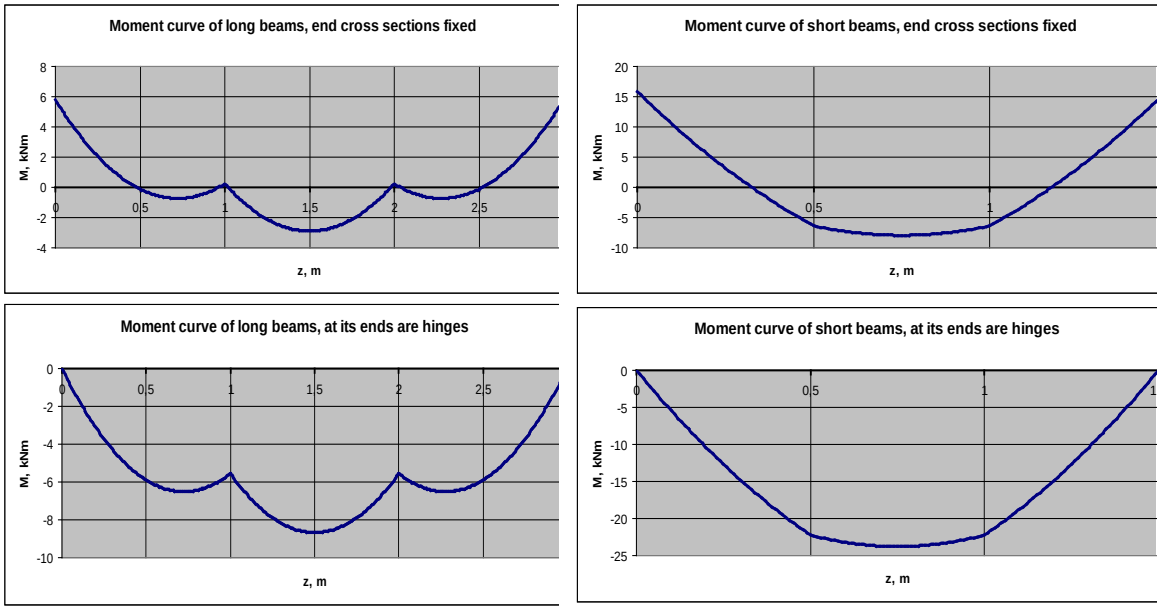


**Fig. 13. Moment curves of bracing beams**

## 5. CONCLUSION

Summing up it is clear that the water chamber of the boiler resists the load caused by test pressure. The pressure inside during operation is maximum 30-40 % of the test pressure. The material and thickness of applied blades moreover the material and cross section of bracing beams and positions are correct. Significant loss in weight cannot be reached without considerable modification of the actual construction.

## REFERENCES

1. M. Csizmadia, B.; Nándori, E. (ed.): Mechanika mérnököknek, Szilárdságtan, Nemzeti Tankönyvkiadó, Budapest, 2003.
2. Béda, Gy.-Kozák, I.: Rugalmas testek mechanikája, Műszaki Könyvkiadó, Budapest, 1987.
3. Páczelt, I.-Szabó, T.-Baksa, A.: A végeselem-módszer alapjai, HEFOP jegyzet, 2007.

# ANALYSIS OF CHANGE OF THE COLOUR PARAMETERS OF PAPRIKA POWDER WITH DIFFERENT ADDED OLEORESIN

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## ABSTRACT

The instrumental colour measurement isn't used in course of the making and the qualification of the paprika powder, although the colour is the most important sense property of its. Paprika is also used as a natural food colour. The colour of paprika powder is very important too, because the consumer concludes its colouring power based on its colour. The colouring power is determined by quality and quantity of colouring agent of paprika squarely. The colour of the powder is influenced by its particle size, oil content and moisture content and first of all the colour agent content.

We investigated how the colour agent content increasing influences the colour characteristics of paprika powders. The L*, a* , b* colour coordinates defined in the CIELab colour space were applied for the colour characterization. The measurements were carried out using a Minolta CR-300 tristimulus colour analyser.

We loosed the colour agent from the paprika powder samples using acetone. The colour agent content of obtained samples was less than 10 ASTA units. After different quantity of oleoresin ( 0.0186g, 0.0461g, 0.0626g, 0.0953, 0.3500g, 0.6399g) was added to samples of 10 g of powder. The colour characteristics and colour agent content of these samples were determined. The relation between colour agent content and colour coordinates was analysed using regression analysis and the colour differences $\Delta E^*_{ab}$ were determined between samples with different colour agent content.

The results depicted that $L^*$ lightness coordinate decreased with increasing colour agent content, the points fitted on a reciprocal function with a significant correlation ( p=0.01). In the case of $a^*$ redness coordinate the points fitted on a saturation function (0.01), the redness coordinate didn't change above 129 ASTA units. The $b^*$ yellowness coordinate increased to 97 ASTA units, then decreased, the points fitted on a second degree function with a significant correlation (p=0.01). The function has maximum at 97.17 ASTA units; the maximum value was 25.22 coordinate units. The value of hue angle ( $h^o_{ab}$ ) progressively decreased while the colour agent content was added. The $C^*_{ab}$ chroma increased to 121 ASTA units, then decreased, the points fitted on a second degree function with a significant correlation (p=0.01). It depicts, that the colour of powder became more red and darker as the colour agent content increased. The colour differences $\Delta E^*_{ab}$ calculated between samples with different colour agent content were smaller above 130 ASTA units. It shows that the rate of the change of the paprika powders colour was smaller while the colour agent content increased.

## 1. INTRODUCTION

The use of natural food colours is preferred to that of artificial dyestuffs for modern alimentary purposes. Paprika is a spice plant grown and consumed in considerable quantities worldwide and also used as a natural food colour. Hungarian paprika powder is still regarded as a "Hungaricum" today. Paprika is cultivated in areas of the world such as Spain, South Africa and South America, where the weather is favourable for the growth of this plant and for the development of its red colouring agents. The large number of hours of sunshine allows the paprika to ripen on its stock, so that the basic material reaching the processing mills has high dyestuff content. Hungarian paprika has a unique aroma and a specific smell, but the production of powder with a good red colour is a considerable problem. The colour of paprika powder is very important,

because the consumer concludes its colouring power based on its colour, although the relation isn't unequivocal between them (H.Horváth, 2005). The colouring power is determined by quality and quantity of colouring agent of paprika squarely, but the colour of the powder is influenced by many factors besides the colouring agent content. Various investigations have been made of the connection between the colouring agent content of the powder and the colour characteristics measured by different techniques (Navarro et al., 1993, Nieto- Sandoval et al., 1999). Such investigations have yielded partial results, but there is no formula that describes the correlation between the colouring agent content and the colour characteristics. Since the 1970s a number of papers have been published on measurements of the colour of paprika powders (Horváth&Kaffka, 1973, Drdak et al., 1980, Huszka et al., 1984, Drdak et al., 1989). Measurements have been performed relating to the changes in the colour stimulus components X, Y and Z of powders during mixing (Huszka et al., 1984) and to the correlation between visual sensing and the instrumentally measured colour characteristics (Huszka et al., 1985). The effects of ionizing irradiation on the colour of paprika powder were investigated by Fekete-Halász et al. (1996). Minguez et al. (1997) analysed how the colour of the powder is changed by the ratio of the yellow and red pigments within the total colouring agent content. Chen et al. (1999) investigated the effects of particle size in Korean cultivars and established that the lightness coordinate of the powder was influenced by the particle size. Applying a Hungarian milling technique, Horváth&Halász-Fekete (2005) demonstrated that the particle size exerts a significant influence on all three colouring characteristics of powders made from Hungarian, South African and South American paprika. Kispéter et al. (2003) investigated the influence exerted on the colour by saturated steam used for germ reduction. In the case of Korean cultivars, no significant change in colour characteristics was detected when the moisture content varied between 10% and 15% (Chen et al., 1999). H.Horváth&Hodúr (2007a) investigated Hungarian paprika powders and depicted, that the colour of the powder was observed to turn into darker and deeper red with increasing moisture content.

The influence of physical and chemical properties of paprika powder on its color was investigated in course of our work. In this paper is presented, how the color characteristics of paprika powders change following increase of color agent content.

## 2. METHODS AND MATERIALS

### 2.1. Color measurement

Color measurements were performed with a Minolta CR-300 tristimulus color measuring instrument. The CIELab color system was used for colour characterization. In this color space the colour points are characterized by three color coordinates. $L^*$ is the lightness coordinate ranging from no reflection for black ($L^*$=0) to perfect diffuse reflection for white ($L^*$=100). The $a^*$ is the redness coordinate ranging from negative values for green to positive values for red. The $b^*$ is the yellowness coordinate ranging from negative values for blue and positive values for yellow.

The total colour change is given by the colour difference ( $\Delta E^*_{ab}$ ), in terms of the spatial distance between two colour points interpreted in the colour space: (Hunter, 1987)

$$\Delta E^*_{ab} = \left[\left(L^*_1 - L^*_2\right)^2 + \left(a^*_1 - a^*_2\right)^2 + \left(b^*_1 - b^*_2\right)\right]^{1/2}. \qquad (1)$$

If 1.5< $\Delta E^*_{ab}$ <3, then the color difference between two paprika grists can hardly be visually distinguished, if $\Delta E^*_{ab}$ >3, then the color difference between two paprika grists can be visually distinguished (H.Horváth, 2007b).

The chroma $\left(C_{ab}^{*}\right)$ was used to determine the change of color.

$$C_{ab}^{*} = \left(\left(a^{*}\right)^{2} + \left(b^{*}\right)^{2}\right)^{\frac{1}{2}} \qquad (2)$$

The chroma represents color saturation which varies dull at low chroma values to vivid color at high chroma values (Hunter, 1987).

The shade of color point was characterised by CIELab $h_{ab}^{0}$ hue angle.

$$h_{ab}^{o} = \operatorname{arctg}\left(\frac{b^{*}}{a^{*}}\right) \qquad (3)$$

## 2.2. Preparation and measurement of the samples with increased color agent content

First the colour agent was loosed from the paprika powder samples using acetone. The colour agent content of obtained samples was less than 10 ASTA units. After different quantity of oleoresin ( 0.0186g, 0.0461g, 0.0626g, 0.0953, 0.3500g, 0.6399g) was added to samples of 10 g of powder. After the color coordinates of these samples were measured in 3 parallel measurements and colour agent content of these samples were determined too.

The relationship between colour agent content and colour coordinates was analysed using regression analysis and the colour differences $\Delta E_{ab}^{*}$ were calculated between samples with different colour agent content.

## 3. RESULTS AND DISCUSSION

Table 1 presents the colour agent content, the lightness coordinate, the redness coordinate, the yellowness coordinate, the hue angle and chroma values of paprika powder samples with different quantity added oleoresin.

**Table 1. The color agent content and color parameters of different samples**

| Quantity of added oleoresin (g) | Color agent content (ASTA) | $L^{*}$ | $a^{*}$ | $b^{*}$ | $h_{ab}^{0}$ | $C_{ab}^{*}$ |
|---|---|---|---|---|---|---|
| 0.0000 | 2 | 49.31 | 5.45 | 21.30 | 75.65 | 21.98 |
| 0.0186 | 21 | 45.88 | 9.36 | 23.96 | 68.66 | 25.72 |
| 0.0461 | 38 | 44.01 | 12.24 | 25.38 | 64.25 | 28.17 |
| 0.0626 | 88 | 40.25 | 16.36 | 25.08 | 56.89 | 29.95 |
| 0.0953 | 129 | 37.50 | 18.40 | 23.32 | 51.72 | 29.71 |
| 0.3500 | 173 | 36.00 | 18.67 | 21.50 | 49.03 | 28.47 |
| 0.6399 | 218 | 34.27 | 18.51 | 19.12 | 45.93 | 26.61 |

Figures 1 demonstrates the relationships between the L*, a* b* colour coordinates and the colour agent content. The color coordinates are presented function of color agent content. The regression function and the determination coefficients are given.

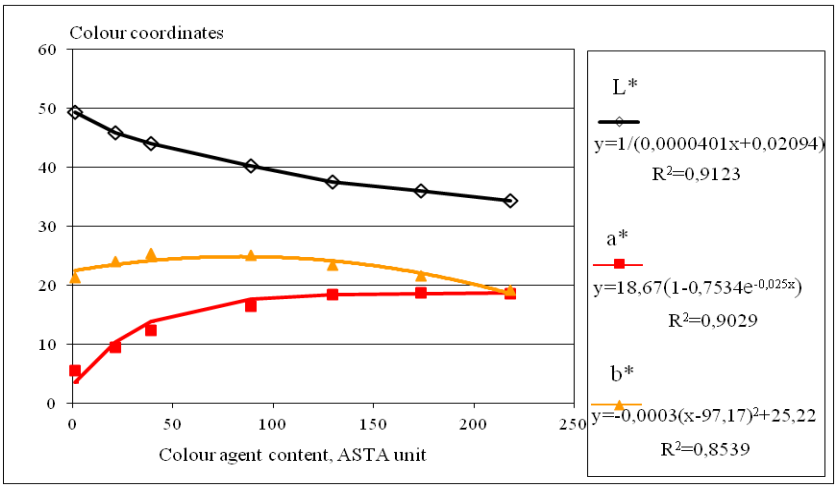


**Fig. 1. Relationship between the L*, a* b* colour coordinates and the colour agent content**

The results depict that $L^*$ lightness coordinate decreased with increasing colour agent content, the points fitted on a reciprocal function with a significant correlation (p=0.01). In the case of $a^*$ redness coordinate the points fitted on a saturation function (0.01), the redness coordinate didn't change above 129 ASTA units. The $b^*$ yellowness coordinate increased to 97 ASTA units, then decreased, the points fitted on a second degree function with a significant correlation (p=0.01). The function has maximum at 97.17 ASTA units; the maximum value was 25.22 coordinate units. Figures 2 presents relationship between the hue angle ($h_{ab}^0$) AND the colour agent content, and relationship between the chroma ($C_{ab}^*$) and the colour agent content. The hue angle and chroma are presented function of color agent content. The regression function and the determination coefficients are given.

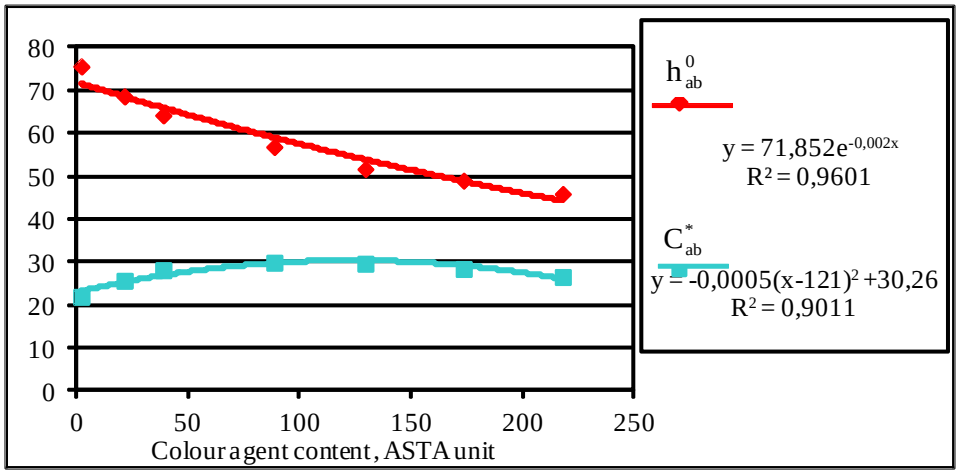


**Fig. 2. Relationship between the hue angle ($h_{ab}^0$) AND the colour agent content, and relationship between the chroma ($C_{ab}^*$) and the colour agent content**

The value of hue angle ($h_{ab}^{\circ}$) progressively decreased while the colour agent content was added. The $C_{ab}^*$ chroma increased to 121 ASTA units, then decreased, the points fitted on a second degree function with a significant correlation (p=0.01). It depicts, that the colour of powder became more red and darker as the colour agent content increased. Figure 3

presents the colour differences $\Delta E^*_{ab}$ calculated between samples with different colour agent content.

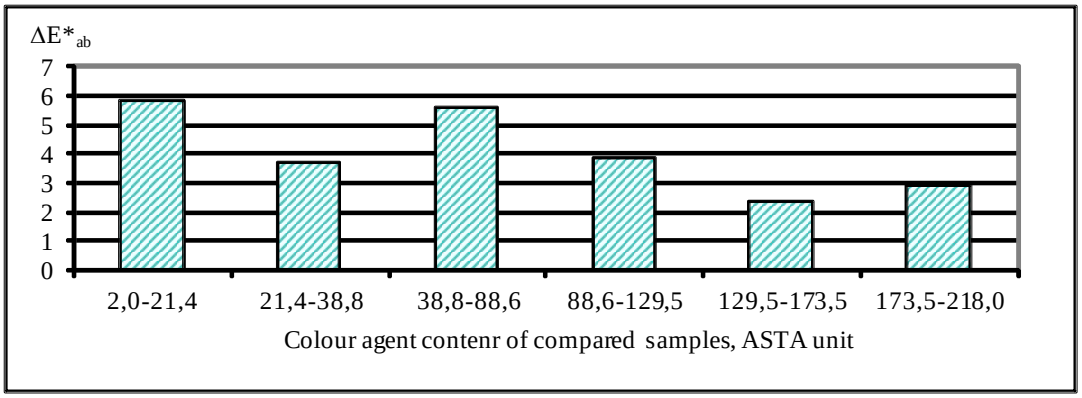


**Fig. 3. Value of colour differences $\Delta E^*_{ab}$ calculated between samples with different colour agent content**

It shows that the colour differences $\Delta E^*_{ab}$ calculated between samples with different colour agent content were smaller above 130 ASTA units. It shows that the rate of the change of the paprika powders colour was smaller while the colour agent content increased. The colour difference between samples was definitely perceptible under 130 ASTA units.

## 4. CONCLUSION

- The $L^*$ lightness coordinate decreased with increasing colour agent content.
- The $b^*$ yellowness coordinate increased to 97 ASTA units, then decreased.
- The value of hue angle ($h^o_{ab}$) progressively decreased while the colour agent content was added.
- The $C^*_{ab}$ chroma increased to 121 ASTA units, then decreased.
- The colour of powder became more red and darker as the colour agent content increased.

## REFERENCES

1. Chen Q., Hak-kyun-koh., Jae-Bok-Park., (1999**):** Color evalution of red pepper powder. Transaction-of-the-ASAE,. 42(3), 749-752.
2. Bok-Park (1999): Color evalution of red pepper powder. Transaction-of-the-ASAE. 42(3), 749-752.
3. Drdak M., Sorman L., Zemkova M., Schaller A., (1980): Ergebnisse von Studien über denZusammenhang zwischen Zusammensetzung und Farbe von gemahlenem Gewürrzpaprika. Confructa, 25(3/4), 141-146.
4. Drdak M., Greif G., Kusy P., (1989): Comparasion between the sensory and spectrophotometric method for determination of colour of paprika powder. Nahrung 33(8), 737-742.
5. Fekete-Halász M., Kispéter J., (1996): Effect of irradiation on colour of ground red paprika. Acta Alimentaria 25(2), 189-193.
6. H.Horváth, Zs., Halász-Fekete M., (2005): Instrumental colour measurement of paprika grist,. Annals of the Faculty of Engineering Hunedora, 101-107.
7. Zs., H.Horváth, C. Hodúr (2007a): The colour of paprika powders with different moisture content. International Agrophysics, 21: 67-72 p.

8. Zs., H.Horváth (2007b): Procedure for setting the colour characteristics of paprika grist mixtures. Acta Alimentaria, 36: 75-88. p
9. Horváth L., Kaffka K., (1973): Instrumental Colorimetry of Red-pepperGrist. Mérés és Automatika 21(9) 341-348. (In Hungarian)
10. Hunter R., 1987. The measurement of appearance. Wiley Press, New York
11. Huszka T., Halászné Fekete M., Horváth M. Zs., Lukács Gy., (1984): Számítógépes színrecept számítási eljárás fűszerpaprika őrlemények optimalizált előállítására. Mérés és Automatika, 32(5) 170-177.(In Hungarian)
12. Huszka T., Halász-Fekete M., Lukács Gy., (1985): Colour Tolerance of Red-Pepper Powders. Hungarian Scientific Instruments 60, 43-47.
13. Huszka, T., Horváth, Zs., Halász-Fekete, M., Véha, A., Gyimes, E., (1990): Computer aided quality planning and production control of red-pepper powders. 4th European Seminar of the EOQ Food Section, Berlin, Procedings, 176-178.
14. Kispéter J., Bajúsz-Kabók K., Fekete M., Szabó G., Fodor G., Páli T., (2003): Changes induced in spice paprika powder by treatment with ionizing radiation and saturated stream. Radiation Physics and Chemistry 68, 893-900.
15. Minguez-Mosquera M. I., Perez-Galvez A. (1997): Color quality in paprika oleoresins. Journal of Agricultural and Food Chemistry 46 (12), 5124-5127.
16. Navarro F., Costa J., (1993): Evalution of Paprika Pepper Color by Tristimulus Colorimerty. Revista Espanola de Ciencia y Tecnologia de Alimentos 33(4):427-434.
17. Nieto-Sandoval J. M., Fernandez-Lopez J. A., Almela L., Munoz J. A., (1999): Dependence betwen apparent color and extractable color in paprika. Color Research and Application 24(2), 93-97.

# LOCAL ECONOMIC IMPACT OF UNIVERSITIES

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**ABSTRACT**

The local economic impact of a large tertiary education institution such as a university is an issue which has attracted considerable attention in literature. Beck et al (1995, 246) define economic impact as „the difference between existing economic activity in a region given the presence of the institution and the level that would have been present if the institution did not exist." Generally, there are three substantial problems. First, the definition of impact, second, measuring and estimating first-round expenditures and avoiding double-counting, third, estimating the correct value of the multiplicator. The economic impact study has become a standard tool used by Western universities to persuade state legislatures of the importance of expenditures on higher education. If this tool is to be used effectively, it must be applied with a methodological rigor that promotes integrity of the process. As economic impact studies become a political tool in the review of education, conservative assumptions and methods should be used to promote objectivity in the research process.

## 1. INTRODUCTION

The impact of higher education institution on local economy is extensively wide. Universities have important impact on the input and the output side, or on the demand and supply side, also. In the first chapter of the article we analyze a general model, while in the second we focus on the economic impacts. Some empirical results are summarized in the third part.

## 2. GENERAL IMPACTS OF UNIVERSITIES

As Florax (1992) and with minor modifications Garrido-Iserte and Galoo-Rivera (1995) show, the regional and local effects of a university can be observed in many fields (see Table 1).

Dusek (2003) sorts the impact into input and output side effects (with students on sides, see Table 2 and 3). He also mentions an important (economic) factor; the main financial source of the university is the government budget.

These classifications are not far from the Segarra I Basco (2003) model, who divided backward and forward effects. Among the forward effect localization factors (instead of attractiveness) he also mentions foreign investment and high-tech companies (that are typical actors of technopolis type clusters).

Huggins and Cook (1997) transferred the keywords into drivers and outcomes, and in their approach, one cannot find hard measures on the driver side, while hardly have soft outcomes.

Brown and Heaney (1997) concluded that the input size effects may be better measured, while the knowledge transfer has mainly social function. Notwithstanding, Beck et al (1995) argues that social (human capital) factors must be heeded, unless the major part of impacts would not be incorporated.

About the OECD's survey on "Higher Education in Regional and City Development" see Keczer (2012).

**Table 1. Classification of regional/local impacts of universities**

| Impact on | Example |
|---|---|
| Politics | Changes in the political structure, an increase in citizen participation, improvement in the organization of political processes |
| Demography | Impacts upon population growth, population structure and upon mobility |
| Economy | Impacts upon regional/local income, industrial structure, job market, labor mobility |
| Infrastructure | Impacts upon housing, traffic, healthcare services, retail |
| Culture | Greater offer in cultural goods, influence upon cultural environment |
| Attractiveness | Influence upon the region's (local) image, regional (local) identity |
| Education | Impact upon participation rate, changes in its quality |
| Social aspects | Impact upon the quality of life, the influence of the students, influence upon the region's (local) image and regional (local) identity |

Source: After Florax (1992) and Garrido-Iserte - Galoo-Rivera (1995)

**Table 2. Regional/local impacts of universities on the input side**

| Actor | Changes |
|---|---|
| Households | + income<br>+ employment<br>+ consumption |
| Local authority | + tax base<br>+ services |
| Business | + volume of business |

Source: After Dusek (2003)

**Table 3. Regional/local impacts of universities on the output side**

| Factor | Changes |
|---|---|
| Human capital | + qualification<br>+ new firms<br>+ migration |
| Knowledge | + university-business relations<br>+ extensive use of resources |
| Attractiveness | + location choice of households and firms<br>+ cultural and social possibilities |
| Business | + research and development, exhibitions |

Source: After Dusek-Kovács (2009)

## 3. ECONOMIC IMPACTS OF UNIVERSITIES

Pallenbarg (2005) modified the table of Lambooy to achieve a complete list of economic impacts (see Table 4). Garrido-Iserte and Gallo-Rivera (2010) also attached importance to the separation of short and long term effects, and constructed a matrix of impacts (see Table 5).

**Table 4. Regional/local economic impacts of universities**

| Economic impacts of a university | Example |
|---|---|
| Employment at the university | Number of university jobs and related institutions |
| University income | State contributions, fees, benefits arising from entrepreneur activity, etc |
| University expenditure | Purchase of goods and services by the university |
| Income and expenditures of the university employees | Wages and salaries, social security costs |
| Effects on the job market | Qualified job provision effect upon productivity; flexible working supply of the students |
| Generation of business | Companies created by university students and employees, with or without employment knowledge and technology |
| Knowledge marketing | The sale of knowledge in a variety of ways: from ideas, courses and patents |

Source: Pallenbarg (2005)

**Table 5. Classification of the economic impacts of the universities**

| Impacts upon | Short term | Long term | |
|---|---|---|---|
| Expenditures | Increase of the regional GDP<br>Salaries<br>Employment<br>Taxes | Steady increase of regional GDP<br>Investments on equipment and installation | |
| Knowledge | Changes in the job market<br><br>Development of human capital | <u>Subjective</u><br>Externalities<br>Workers productivity<br>Increase of income throughout life | <u>Objective</u><br>Patents<br>Investigation and development |

Source: Garrido-Iserte and Gallo-Rivera (2010)

Brown and Heaney (1997) compare two approaches of the computation, the economic-base approach and the skill-base approach. Johnson (1994) argues to divide local and local, direct and indirect impacts, but he also attends to various negative impacts of universities and to the necessity of a net approach (i.e. individuals could spend more, if the government did not tax them to be able to pay the expenditures of universities.
In Bleaney et al (1992) we can find a brief, but clear mathematical deduction of the formula of the Keynesian regional multiplicator. This method is the most often used computation, with a series of disadvantages and deficiencies. Its simplicity makes it so popular.

## 4. CONCLUSIONS

Even if the theoretical background is well-known, estimation methods are wrought and discussed (see for example Siegfried et al, 2006), and many international empirical example can be found in the literature (Caroll-Smith 2006, Blackwell et al 2002, Pallenbarg 2005, Jabalameli et al 2010, Tavoletti 2007, Huggins and Cook 1997, Bleaney et al 1992, Bridge 2005, Ohme 2003), only one finished case study is known for Hungary, the case of the University of Győr (Széchenyi István University). Some

steps were also made in Pécs (Mezei, 2005) and in Zalaegerszeg, but these researches have not reached the level of having at least one numerical result. An optimal state of art would be having multiple results with different methods and comparative analysis of applicable country-specific methods. This goal is very far yet, but the way is open to achieve.

## REFERENCES


1. Beck, R., Elliott, D., Meisel, J., Wagner, M. (1995): Economic impact studies of regional public colleges and universities. Growth and Change, pp. 245-260.
2. Blackwell, M., Cobb, S., Weinberg, D. (2002): The Economic Impact of Educational Institutions: Issues and Methodology. Economic Development Quarterly, Vol 16, no 1, pp. 88-95.
3. Bleaney, M. F., Binks, M. R., Greenaway, D., Reed, G., Whynes, D. K. (1992): What does a university add to its local economy? Applied Economics, 24, pp. 305-311.
4. Bridge, M. (2005): Higher education economic impact studies: accurate measures of economic impact? Journal of College Teaching and Learning, 2, pp. 37-47.
5. Brown, K. H., Heaney, M. T. (1997): A Note on Measuring the Economic Impact of Institutions of Higher Education. Research in Higher Education, vol 38, no 2, pp. 229-240.
6. Caroll, M. C., Smith, B. W. (2006): Estimating the Economic Impact of Universities: The Case of Bowling Green State University. The Industrial Geographer, Vol 3, no 2, pp. 1-12.
7. Dusek, T. (2003): A felsőoktatás lokális termelésre és jövedelmekre gyakorolt hatása. In: A Széchenyi István Egyetem hatása a régió fejlődésére. Szerk: Rechnitzer János-Hardi Tamás. Széchenyi István Egyetem Gazdaság- és Társadalomtudományi Intézet, Győr, pp. 60-71.
8. Dusek T. – Kovács N. (2009): A Széchenyi István Egyetem hatása a helyi munkaerőpiacra. – In: A Virtuális Intézet Közép-Európa Kutatására (VIKEK) Évkönyve, II. Régiók a Kárpát-medencén innen és túl konferencia tanulmányai, pp. 69-73.
9. Florax, R. (1992): The university: a regional booster? Avebury, England
10. Garrido-Iserte, R., Gallo-Rivera, M. T. (2010): The impact of the university upon local economy: three methods to estimate demand-side effects. Annals of Regional Science, 44, pp. 39-67.
11. Huggins, R., Cooke, P. (1997): The economic impact of Cardiff University: innovation, learning and job generation. GeoJournal Vol. 41. no 4: pp. 325–337.
12. Jabalameli, F., Ahrari, M., Khandan, M. (2010): The Economic Impact of University of Tehran on the Tehran District Economy. European Journal of Social Sciences, vol 13, no 4, pp. 643-652.
13. Johnson, T. M. (1994): Estimating the Economic Impact of a College or University on a Nonlocal Economy. PhD dissertation, Texas Tech University, Texas.
14. Keczer, G. (2012): A felsőoktatási intézmények szerepvállalása a régió- és város-fejlesztésben. Közép-európai Közlemények V. évfolyam 1. szám, pp. 136-144.
15. Mezei, K. (2005): A Pécsi Tudományegyetem hatása a város gazdaságára. In: A magyar városok kulturális gazdasága. MTA Társadalomkutató Központ, Budapest.
16. Ohme, A. M. (2003): The Economic Impact of a University on Its Community and State Examining Trends Four Years Later. University of Delaware, mimeo.
17. Pellenbarg, P. H. (2005): How to Calculate the Impact of University on the Regional Economy. Paper presented to the Conference on Knowledge and Regional Economic Development, Barcelona, 9-11 June 2005.

18. Robert, H., Cooke, P. (1997): The economic impact of Cardiff University: innovation, learning and job generation. GeoJournal, vol 41, no 4, pp. 325-337.
19. Segarra i Blasco, A. (2004): La universitat com a instrument de dinamització socioconómica del territori. Coneixement i Societat, 03, pp. 78-101.
20. Tavoletti, E. (2007): Assessing the Regional Economic Impact of Higher Education Institutions: An Application to the University of Cardiff. Transition Studies Review, vol 14, no 3, pp. 507-522.

# WASHINGTON, BRUSSELS, AND BEIJING CONSENSUS

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## ABSTRACT

In the new world financial, economic and nowadays debt crisis, the role of international organizations is in focus again. The financial crisis opens the way for IMF credits and for thinking in the European Union. After the second millenary, a scientific dispute started about the credibility of the Washington Consensus in many parts of the world. A new school emerged around Bruno S. Sergi, Roberto Tamborini, and William T. Bagatelas, who has been speaking about a transition from Washington consensus towards Brussels consensus in the case of Eastern European countries. Sergi carefully and precisely calls for specific and active state directed policy that puts economic transition in Europe in a new dimension. By Bagatelas, specifically, under the EU dimension, development under the new "Brussels Consensus" consists of activist state policies based upon assumptions given the world by Keynes, Schumpeter and supply side beliefs. Empirical studies also proved this structural break in macroeconomic policy. Now, the debate on appropriate economic policy is very active again. As in times of recession, Keynes and Keynesian economics has become popular, but the role of the state (and the international organizations) is sorely ambiguous. Our paper is to compare the Washington and the Brussels consensus from a heterodox point of view, and to find the differences of the two conceptions. Finally, we sketch the controversial concept of Beijing Consensus.

## 1. INTRODUCTION

When Williamson first mentioned the so-called 'Washington consensus', he could not think this concept launch a branch of articles with different consensuses and an important debate will start about the existence of them. During Eastern European transition, at the moment of the inauguration of the euro, and since the breakout of the current credit crisis, some concepts are highlighted. From Washington through Brussels and Frankfurt to Beijing, a series of centers of the economic policy stands for consensuses.

## 2. THE THREE FAMOUS CONSENSUS

### 2.1. The Washington Consensus

The Washington Consensus (WC) was first mentioned by John Williamson (1989) to describe a set of ten specific economic policy prescriptions for developing world. It acquires the 'one size fits all' rule of the International Monetary Fund of those ages. Serra et al (2008) retrospect WC as a consensus for liberalization and globalization rather than a consensus for equitable growth and sustainable development.

The consensus as originally stated by Williamson included ten broad sets of relatively specific policy recommendations. However, the literature (including Williamson's later work) quotes Williamson's original paper in many ways (see Birdsall et al, 2010, Williamson, 1989, Williamson, 1993, Williamson, 2008). Here, we list the original headings of the Williamson speech, with his later explanations and re-explanations.

1. **Fiscal deficits – fiscal policy discipline**, with avoidance of large fiscal deficits relative to GDP (Budget deficits – properly measured to include local governments, state enterprises, and the central bank – should be small enough to be financed without recourse to the inflation tax.);

2. **Public Expenditure Priorities – redirection of public spending** from subsidies toward broad-based provision of key pro-growth, pro-poor services like primary education, primary health care and infrastructure investment (Public spending should move away from politically popular but economically unwarranted projects (bloated bureaucracies, indiscriminate subsidies, white elephants) and towards neglected fields with high economic returns and the potential to improve income distribution (primary health and education, infrastructure);
3. **Tax reform**, broadening the tax base and adopting moderate marginal tax rates (To improve incentives and horizontal equity, the tax base should be broad and marginal tax rates moderate. Taxing interest on assets held abroad (flight capital) should become a priority in the medium term.);
4. **Interest rates dictated by market forces – Positive Real Interest Rates** (Ultimately, interest rates should be market determined. As this could be destabilizing in an environment of weak confidence, policy should have more modest objectives for the transition, mainly to abolish preferential interest rates for privileged borrowers and achieve a moderately positive real interest rate.);
5. **Competitive exchange rates** (Countries need a unified (at least for trade transactions) exchange rate set at a level sufficiently competitive to induce a rapid growth in non-traditional exports, and managed so as to assure exporters that this competitiveness will be maintained in the future.);
6. **Trade liberalization**: liberalization of imports, with particular emphasis on elimination of tariffs (Quantitative trade restrictions should be replaced by tariffs, and these should be progressively reduced until a uniform low tariff in the range of 10 percent is achieved.);
7. Liberalization of inward **foreign direct investment** (Barriers impeding foreign direct investment and the entry of foreign firms should be abolished; foreign and domestic firms should be allowed to compete on equal terms.);
8. **Privatization** of state enterprises (State enterprises should be privatized);
9. **Deregulation**: abolition of regulations that impede market entry or restrict competition, except for those justified on safety, environmental and consumer protection grounds, and prudential oversight of financial institutions (Governments should abolish regulations that impede the entry of new firms or restrict competition, and ensure that all regulations are justified by such criteria as safety, environmental protection, or prudential supervision of financial institutions.);
10. **Legal security for property rights** (The legal system should provide secure property rights without excessive costs, and make these available to the informal sector.).

In a book edited with Pedro-Pablo Kuczynski in 2003, Williamson laid out an expanded reform agenda, emphasizing crisis-proofing of economies, "second-generation" reforms, and policies addressing inequality and social issues. Dani Rodrik (2006) refers this list as ’augmented Washington Consensus’.

1. Corporate governance
2. Anti-corruption
3. Flexible labor markets
4. WTO agreements
5. Financial codes and standards
6. Prudent capital-account opening

7. Non-intermediate exchange rate regimes
8. Independent central banks/inflation targeting
9. Social safety nets
10. Targeted poverty reduction

Kanbur (2008) emphasizes that challenges to the consensus emerged in the moment when it was formulated. By the end of the 1990's, more and more critical papers were published about the WC. Clift (2003) thinks beyond the Consensus with heavy sarcasm towards Williamson's Washington Consensus II. The status of the debate in 2005 is finely summarized by Gnos and Rochon (2005). The strong skepticism can be described well by the expression 'Washington Confusion', first appeared in 1999 (Naim, 1999) and rehashed by Rodrik (2006): "… nobody really believes in the Washington Consensus anymore. The question now is not whether the Washington Consensus is dead or alive; it is what will replace it." In his famous speech in 2009, Gordon Brown said "… the Washington Consensus is over".
In 2008, the consensus about the death of Washington Consensus was built, as Stiglitz (2008) or Estevadeordal-Taylor (2008) demonstrated. Moreover, Stiglitz thinks that the future of a uniform economic policy toolpack is dubious, as "… there is no… Post-Washington Consensus consensus".

### 2.2. The Brussels Consensus

Meanwhile in Brussels, the European Union, and distinguished the European Monetary Union (theoretically based on Mundell's theory on optimal currency areas) is built on the Washington Consensus. The common monetary policy of European Central Bank, and the theoretically independent fiscal policy restricted by the Maastricht treaty and the Stability and Growth Pact (SGP), the small and inflexible EU budget, and overall the often lack of coordination between monetary and fiscal policy, and between fiscal policy across countries (Farina-Ricciuti, 2007, Pisani-Ferry, 2010) conduce to the introduction of Brussels Consensus. As many publications (see Bagatelas, 2004, Tamborini, 2003, Irvin, 2005) suggest, instead of Latin-American and Eastern European countries, the main user of the Washington Consensus is the EU. Fitoussi and Saraceno (2004) dare to call it as 'Washington-Frankfurt-Brussels Consensus'. We finished our previous chapter with the consensus on the end of the Washington Consensus, but what about European Union? Is it also over?
The Brussels Consensus has some successes and failures in the pre-crisis period. We can see (De Grauwe, 2006, Farina-Ricciuti, 2007, Le Cacheux-Saraceno, 2007, Perry-Servén, 2008, Tamborini, 2002) that the monetary policy had a relatively good performance (stable and low inflation rate), but the growth and fiscal policy goals are not reached (Jones, 2007). Even the European Union is split; the euro zone members had much lower growth performance than non-euro zone union members (also before the first wave of accession of Eastern European countries). The rules of the European Monetary Union are also very soft. At the moment of the birth of euro, only 5 of 12 euro zone members fulfilled the government debt criterion, and the average government debt / GDP ratio was always over 70% (it should not exceed 60% in all countries).

### 2.3. The Beijing Consensus

Ramo (2004) argues that the success of China (and also other BRIC countries) contradicts every single principle formulated in the Washington Consensus. He forms 3 guidelines of this policy mix, under the name of Beijing Consensus (BC):

- Innovation and constant experimentation;

- Rejection of GDP growth above all in favor of sustainability and equality;
- Self-determination

The BC is formed, merely, around three ideas, which are in themselves less tangible and more subjective then those of the WC. (Turin, 2010) Although ambitious, the original conception of the BC is not up to the task of being a worthwhile competitor to the alternative model from which its name was coined, not because of the WC's apparent worthiness, but rather because the BC is a misguided and inaccurate summary of China's actual reform experience. (Kennedy, 2010)

To be more precise, in his January 2012 article in Williamson (2012) describes the Beijing Consensus as consisting of five points:
1. Incremental Reform (as opposed to a Big Bang approach),
2. Innovation and Experimentation,
3. Export Led Growth,
4. State Capitalism (as opposed to Socialist Planning or Free Market Capitalism).
5. Authoritarianism (as opposed to Democracy or Autocracy).

Li et al (2009b) argue that even though there are some problems in Ramo's original definition of Beijing Consensus, it should not be rejected altogether. In Li et al (2009b) 10 principles of the BC can be found as:

1. Localization of best practices borrowed
2. Combination of market and plan
3. Flexible means to a common end
4. Policy rights
5. Stable political environment
6. Self-reliance
7. Constantly upgrading industry
8. Indigenous innovation
9. Prudent financial liberalization
10. Economic growth for social harmony

Chinese government officials and academics themselves have embraced some of the main claims in the Beijing Consensus. In particular, they have embraced the idea that Chinese growth is driven by economic statism—that is, the state exerting extensive control over the economy—rather than by the vibrancy of the market and influential private entrepreneurship. (Huang, 2011) Leonard (2006) also argues that the concept of the Beijing Consensus is soft; one can find different interpretations and lists of its elements. Lee and Mathews (2008) try to widen the concept towards a Far East perspective, by defining the Beijing-Seoul-Tokyo Consensus:

***A. Two Agents***

- Private Firms (PF) and Pilot Developmental Agency (G)

***B. Processes for Capability Building (PF + G)***

- Arranging accesses for external knowledge
- Export-based engagement with global economy for disciplinary learning
- Targeting import-substituting technologies/sectors
- Sequential upgrading for dynamic comparative advantages

***C. External Environment for Capacity building (G)***

- Generic human capital enhancement
- Catch-up friendly financial system

- Macroeconomic stability
- Phasing out of non-market interventions

In Kolodko's opinion (Kolodko, 2012), the economic development strategy shouldn't rely on "Beijing Consensus", nor the already compromised "Washington Consensus". It must be crafted from something in between. He offers a new pragmatism based on country's specific factors.

## 3. CONCLUSION

The European economic policy applied until the deepening of the current crisis leads to government debt in long term and results great growth losses for all Europe. The institutional frame of the EU – implemented along the Washington Consensus – seems to fail its macroeconomic goals, as generates low growth rates and growing government debt. In 2012, some positive changes (new pacts) started, but we cannot be sure how these paper tigers will be implemented. We do not think that a worldwide Beijing-type consensus would be the solution for the problems of the world economy, but shifting towards an economic view described in the measure of Gross National Happiness is not inconceivable. Since the break-away of European debt crisis, forces towards self-determination and economic (or political economic) individualism has been strengthened. Emphasizing sustainability and equality in times of no growth is not fair policy.

## REFERENCES

1. Bagatelas, W. (2004): Replacing the Washington Consensus with the Brussels Consensus. Paper presented at "Catalysts and Impediments of Economic Development in Central and Eastern Europe" Vilnius University, 14-15 October, 2004 / Vilnius, Lithuania
2. Birdsall, N., de la Torre, A., Caicedo, F. V. (2010): The Washington Consensus: Assessing a Damaged Brand. Working Paper 213, Center for Global Development, Washington D.C.
3. Clift, J. (2003): Beyond the Washington Consensus. Finance & Development September 2003 p.9.
4. De Grauwe, P. (2006): On Monetary and Political Union. CESIfo Forum 4/2006.
5. Estevadeordal, A., Taylor, A. M. (2008): Is the Washington Consensus Dead? Growth, Openness, and the Great Liberalization, 1970-2000. NBER Working Paper Series, Working Paper 14264. http://www.nber.org/papers/w14264
6. Farina, F., Ricciuti, R. (2007): Fiscal policy in Europe and the Stability and Growth Pact. Econômica, vol. 9., no. 1., pp.33-61.
7. Fitoussi, J-P., Saraceno, F. (2004): The Brussels-Frankfurt-Washington Consensus. Old and New Tradeoffs in Economics. Observatoire Français des Conjonctures Économiques, no 2004-02.
8. Huang, Y. (2011): Rethinking the Beijing Consensus. Asia Policy, No. 11., pp. 1–26
9. Gnos, C., Rochon, L-P. (2005): What is next for the Washington consensus? The fifteenth anniversary, 1989–2004. Journal of Post Keynesian Economics. Winter 2004–5, Vol. 27, No. 2., pp. 187-193.
10. Irvin, G. (2005): The Implosion Of The Brussels Economic Consensus. International Centre For Economic Research Working Paper Series, Working Paper No. 11 / 2005
11. Jones, E. (2007): European Fiscal Policy Coordination and the Persistent Myth of Stabilization. Paper presented at EUSA Tenth Biennial International Conference, Montreal, Canada, May 17-May 19, 2007

12. Kanbur, R. (2008): The Co-Evolution of the Washington Consensus and the Economic Development Discourse. Macalester International Vol. 24, pp. 33-57.
13. Kennedy, S. (2010): The Myth of the Beijing Consensus. Journal of Contemporary China, Vol. 19, Issue 65, pp 461-477.
14. Kolodko, G. W. (2012): Neither Washington, Nor Beijing Consensus, But the New Pragmatism. http://www.economonitor.com/blog/2012/01/neither-washington-nor-beijing-consensus-but-the-new-pragmatism/
15. Kuczynski, P-P., Williamson, J. (eds) (2003): After the Washington Consensus: Restarting Growth and Reform in Latin America. Washington, D.C.: Institute of International Economics.
16. Le Cacheux, J., Saraceno, F. (2007): One size does not fit all: country size and fiscal policy in a monetary union . 147-160. In: Farina, F., Tamborini, R. (eds): Macroeconomic Policy in the European Monetary Union. From the old to the new Stability and Growth Pact. Routledge, London.
17. Lee, K., Mathews, J. A. (2010): From Washington Consensus to BeST Consensus for world development. Asian-Pacific Economic Literature, Vol. 24, Issue 1, pp. 86–103.
18. Leonard, A. (2006): No consensus on the Beijing Consensus. http://www.salon.com/tech/htww/2006/09/15/beijing_consensus/
19. Li, X., Brødsgaard, K. E., Jacobsen, M. (2009a): Redefining Beijing Consensus: Ten general principles. Copenhagen Discussion Papers 29.
20. Li, X., Brødsgaard, K. A., Jacobsen, M. (2009b): Redefining Beijing Consensus: ten economic principles. China Economic Journal, Vol. 2., No. 3., pp 297-311.
21. Naim, M. (1999): Fads and Fashion in Economic Reforms: Washington Consensus or Washington Confusion? Foreign Policy Magazine. October 26, 1999
22. Perry, G. E., Servén, L. (2008): Fiscal Policy, Stabilization, and Growth. Prudence or Abstinence? The International Bank for Reconstruction and Development/The World Bank
23. Pisani-Ferry, J. (2010): Europe’s federalism debate revived. http://www.social-europe.eu/2010/07/europes-federalism-debate-revived/
24. Ramo, J. C. (2004): The Beijing Consensus. The Foreign Policy Centre, London.
25. Rodrik, D. (2006): Goodbye Washington Consensus, Hello Washington Confusion? A Review of the World Bank's Economic Growth in the 1990s: Learning from a Decade of Reform. Journal of Economic Literature, Vol. 44, No. 4, pp. 973-987
26. Serra. N., Spiegel, S., Stiglitz, J. E. (2008): Introduction: From the Washington Consensus Towards a New Global Governance. In: Serra, N., Stiglitz, J. E. (eds): The Washington Consensus Reconsidered. Oxford University Press Inc., New York. pp. 3-13.
27. Stiglitz, J. E. (2008): Is there a Post-Washington Consensus Consensus? In: Serra, N., Stiglitz, J. E. (eds): The Washington Consensus Reconsidered. Oxford University Press Inc., New York. pp. 41-56.
28. Tamborini, R. (2002): One "monetary giant" with many "fiscal dwarfs": The efficiency of macroeconomic stabilization policies in the European Monetary Union. Universita' Degli Studi Di Trento - Dipartimento Di Economia Discussion Paper No. 4.
29. Tamborini, R. (2003): The "Brussels consensus". On macroeconomic stabilization policies in the EMU. A critical assessment. Paper presented at 1st EUI Alumni Conference: Governing EMU: Political, Economic, Legal and Historical perspectives. European University Institute, October 3/4, 2003

30. Turin, D. R. (2010): The Beijing Consensus: China's Alternative Development Model. *Student Pulse*, 2.01. http://www.studentpulse.com/a?id=134
31. Williamson, J. (1989): What Washington Means by Policy Reform, in: Williamson, J. (ed.): Latin American Readjustment: How Much has Happened, Washington: Institute for International Economics.
32. Williamson, J. (1993): Democracy and the 'Washington Consensus'. World Development, vol. 21, pp. 1329-1336.
33. Williamson, J. (2008): A Short History of the Washington Consensus. In: Serra, N., Stiglitz, J. E. (eds): The Washington Consensus Reconsidered. Oxford University Press Inc., New York. pp. 14-30.
34. Williamson, J. (2012): Is the "Beijing Consensus" Now Dominant? Asia Policy, No. 13., pp. 1–16

# THROMBOTIC EVENTS IN MYELOPROLIFERATIVE NEOPLASMS COULD "MEDICAL NUTRITION THERAPY" HAVE AN ADDITIONAL BUT IMPORTANT ROLE?

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## ABSTRACT

Polycythemia vera (PV), and essential thrombocythemia (ET) patients are characterized by an increased incidence of arterial and venous thromboses. To prevent vascular events is one of the most important challenges in the disease management, as thrombosis could be responsible for the morbidity and mortality in many cases. Since thrombosis can be an early complication of MPNs, an effective antithrombotic strategy has to be started as soon as the disease is diagnosed. Beside the use of appropriate medical therapies and preventive measures against cardiovascular risk factors, a healthy lifestyle may also have importance in MPNs, as it has already been accepted in the general population. However, it has not been accepted yet in the treatment of neoplasms, according to the general notion, thrombosis is "caused" by the disease rather than by the interplay of various factors. The relation between the disease and the thrombotic events is indisputable, though the role of the neoplasm accompanied by other diseases such as diabetes mellitus, cardiovascular diseases, or unhealthy life style, obesity, and smoking should be mentioned as addictive factors in case of myeloproliferative neoplasms thus increasing the susceptibility to developing a thrombosis. In this short communication, according to relevant medical literature, the author describes her concerns if cardiovascular diseases may be prevented by eliminating modifiable risk factors, and following a healthy diet, healthy life style and controlling body weight, and whether it may have an important benefit in the successful management of MPN patients. Should we apply the "medical nutrition therapy" consciously in the most appropriate and effective antithrombotic strategy?

## 1. INTRODUCTION

Philadelphia Chromosome "negative" myeloproliferative neoplasms (MPN) is a diverse group of hematological malignancies. MPNs are characterized by stem cell-derived clonal myeloproliferation primarily characterized by erythrocytosis and thrombocytosis with predisposition to thrombosis, bleeding, and the possibility of leukemic transformation. Polycythemia vera (PV) and essential thrombocythemia (ET) patients are characterized by an increased incidence of arterial and venous thromboses and by microcirculatory disturbances which often manifest in the diagnosis or in the preclinical phase of the disease. (Michiels, Abels et al. 1985) To prevent a significant number of early vascular events is still one of the most important challenges in the disease management, because thrombosis could be a major cause of morbidity and mortality in patients in many cases. (Tefferi 2012) Thus an effective antithrombotic strategy has to be started as soon as the disease is diagnosed. According to the international protocols, this strategy mostly includes treatment in different combination of low-dose aspirin, clopidogrel bisulfate, hydroxyurea, and interferon therapy. Phlebotomy also could be used accordingly as a risk adapted decision. (Vladareanu 2010)

## 2. SUMMARY OF THE RELEVANT LITERATURE

Several epidemiological studies performed in the field of the nutrition and physical activity of the general population are predictors of age-specific mortality and cardiovascular events. The connection between cardiovascular risk factors and

thrombosis is not doubted any more, and the identification and appropriate management of cardiovascular risk factors, the promotion of a healthy lifestyle in the general population have become important and popular. According to the World Heart Federation’s opinion: (Bas, Altan et al. 2005;Poirier, Giles et al. 2006Waskiewicz, Piotrowski et al. 2008) ”The role of diet is crucial in the development and prevention of cardiovascular diseases. Diet is one of the key things you can change that will impact all other cardiovascular risk factors.” Table 1 introduces the modifiable risk factor which could be important according to the World Heart Federation’s opinion.

**Table 1. Risk factors associated with coronary heart disease and stroke according to the World Heart Federation**

| *Modifiable risk factors* | *Non-modifiable risk factors* |
|---|---|
| Hypertension | Age |
| Abnormal blood lipid levels | Gender |
| Tobacco | Ethnicity |
| Physical inactivity | Family history of cardiovascular diseases |
| Type 2 diabetes | |
| Diet high in saturated fat | |
| Chronically stressful life | |
| Social isolation | |
| Anxiety and depression | |
| Contraceptive pills | |
| Hormone replacement therapy | |

Source: World Heart Federation (2012)

But what about patients with MPNs? Does diet have as important a role as in the general population? On the contrary, the importance of a healthy lifestyle is frequently misjudged in MPN patients due to the tendency to consider thrombosis as it has been ”caused” by the disease rather than by the interplay of various factors. ECLAP is a randomized trial (European Collaboration on Low-dose Aspirin in Polycythemia Vera ), which has many observations to support the idea that besides the basic medical antithrombotic strategy, we have to focus more on the modifiable risk factors in MPN patients as well. According to the publication of Finazzi G. in 2004, the cumulative incidence rate of cardiovascular events (i.e., cardiovascular death and non-fatal thrombotic events) was 5.5 events/100 persons per year. The main cause of death was thrombosis. Their results showed that the two most important predictors of cardiovascular events were age (higher than 65 years) and positive history of thrombosis. Nevertheless, they have found smoking, hypertension and congestive heart failure to be further significant risk factors for thrombosis.(Finazzi 2004) In the same trial in 2007, Landolfi et al. also described smoking as a habit that had an important effect on vascular risk associated with a significantly higher risk of arterial thrombotic events, and not just in the general population but among PV patients as well. A similar finding had been reported also in ET subjects by Besses et al. in 1999 and Jantunen in 2001. (Besses, Cervantes et al. 1999; Jantunen, Juvonen et al. 2001) Additionally, the ECLAP observational study has shown that diabetes was a possible predictor of survival and cardiovascular mortality in MPN patients. According to the above mentioned studies, it is supposed that arterial hypertension, hypercholesterolemia, obesity and metabolic syndrome, the well-known major risk factors for the development of

cardiovascular diseases in the general population, could have an important role as the predictors of thrombosis in MPN patients despite the limited results. But surprisingly, we could find publications which rather contradicted the above mentioned notions. A few clinicians like Besses have found that ET patients demonstrated the independent contribution of hypercholesterolemia in predicting thrombosis. (Besses, Cervantes et al. 1999) According to the relevant literature, the efficacy of statins in MPNs has yet to be tested in prospective studies, but their possible use in MPNs deserves clinical and scientific attention. In the view of nutrition, epidemiological studies and clinical trials indicate the importance of nutrition. In a prospective study, over 12 years, 14,962 middle-aged adults participating in the Atherosclerosis Risk in Communities Study were followed up for incident VTE. According to their conclusion, it could be supposed that diet including more plant food and fish, and less red and processed meat could be associated with a lower incidence of venous thromboembolism. (Lichtenstein, Appel et al. 2006) The very long chain n-3 fatty acids lower the thrombotic tendency and risk of heart diseases. Other polyunsaturated fats and monounsaturated fat appear to have antithrombotic properties, but further studies are needed to reveal it. (Lands, Libelt et al. 1992) Low intake of folate, vitamin B12, and vitamin B6 predispose patients to hyperhomocysteinemia, and the benefits of their supplementation in decreasing vascular diseases are under investigation.(Erzin, Uzun et al. 2008) Dietary flavonoids like apigenin and luteolin, and isoflavones like genistein appear to inhibit platelet aggregation only in pharmacological concentrations. (Clair and Anthony 2005) (Liu, Xing et al. 2006) Among the group of flavonoids, apigenin is very interesting as Navarro-Nunez L’s results demonstrate a clear increase in the ex vivo antiplatelet effect of aspirin in the presence of apigenin, which encourages the idea of the combined use of aspirin and certain flavonoids in patients, in whom aspirin fails to properly suppress the TxA(2) pathway. (Navarro-Nunez, Lozano et al. 2008) As we can see, diet presents an interesting area for research also in the field of general medicine, but work is indicated before specific recommendations are made. (Allman-Farinelli and Dawson 2005) According to the relevant literature in myeloproliferative neoplasms, the suspected factors could play an important role in the development of thrombosis in MPN patients, as a conclusion showed in Table 2.

**Table 2. Factors that are suspected to play an important role in the development of thrombosis in MPN patients**

| ***Disease related abnormalities*** | ***Cardiovascular risk factors*** |
|---|---|
| Hyperviscosity | Obesity |
| Leukocyte abnormality | Diabetes |
| Platelet abnormality | Hypertension |
| Inflammation | Smoking |
| JAK2 V617F mutation | Unhealthy diet |
| ***Other factors*** | Lack of physical activity |
| Previous thrombosis | |
| Age | |
| Gender | |
| Other genetic mutations | |
| Other unknown factors, local, general triggers | |

Source: World Heart Federation (2012)

## 3. CONCLUSIONS

The American Dietetic Association introduced a new aim in 2010, the goal of which is the integration of ”Medical Nutrition Therapy (MNT) and Pharmacotherapy” and introduced many guidelines as in diabetes mellitus, summarizing the evidence for the effectiveness of MNT in preventing and treating diabetes, and providing physicians with information on how to refer patients to MNT. The initiation and ongoing use of medical therapy is essential in myeloproliferative patients to prevent the development of disease complications and to manage the disease appropriately. As the life expectancy of patients in adequate condition is very promising, the survival years can reach up to several decades. Although the most frequent cause of death is patients is thrombosis, it is an interesting question whether conscious life style of these patients can lead to the achievement of a more beneficial therapy and whether thrombotic events may be prevented to a certain extent (parallel to medical therapy), thus achieving a longer life span. Conscious, healthy nutrition has an unequivocal role in preserving vascular intactness, and therefore, further investigation is needed in this topic. It is also vital to encourage patients to follow a healthy lifestyle. Nevertheless, its possible use in MPNs deserves clinical and scientific attention. Therefore, diet as one of the environmental factors has an impact on the development of thrombosis and hemostasis, and macronutrients, micronutrients, and other bioactive food components may alter the predisposition to thrombosis. However, in many cases such as the management of diabetes, the evidence is strong that medical nutrition therapy provided by registered dietitians is an effective and essential therapy, but in MPN neoplasms no strong evidence has been established yet. Though according to the known details, this notion should not be neglected, especially in the view of controlling risk factors.

## REFERENCES

1. Allman-Farinelli, M. A. and B. Dawson (2005). "Diet and aging: bearing on thrombosis and hemostasis." Semin Thromb Hemost **31**(1): 111-117.
2. Bas, M., T. Altan, et al. (2005). "Determination of dietary habits as a risk factor of cardiovascular heart disease in Turkish adolescents." Eur J Nutr **44**(3): 174-182.
3. Besses, C., F. Cervantes, et al. (1999). "Major vascular complications in essential thrombocythemia: a study of the predictive factors in a series of 148 patients." Leukemia **13**(2): 150-154.
4. Clair, R. S. and M. Anthony (2005). "Soy, isoflavones and atherosclerosis." Handb Exp Pharmacol(170): 301-323.
5. Erzin, Y., H. Uzun, et al. (2008). "Hyperhomocysteinemia in inflammatory bowel disease patients without past intestinal resections: correlations with cobalamin, pyridoxine, folate concentrations, acute phase reactants, disease activity, and prior thromboembolic complications." J Clin Gastroenterol **42**(5): 481-486.
6. Finazzi, G. (2004). "A prospective analysis of thrombotic events in the European collaboration study on low-dose aspirin in polycythemia (ECLAP)." Pathol Biol (Paris) **52**(5): 285-288.
7. Jantunen, R., E. Juvonen, et al. (2001). "The predictive value of vascular risk factors and gender for the development of thrombotic complications in essential thrombocythemia." Ann Hematol **80**(2): 74-78.
8. Lands, W. E., B. Libelt, et al. (1992). "Maintenance of lower proportions of (n - 6) eicosanoid precursors in phospholipids of human plasma in response to added dietary (n - 3) fatty acids." Biochim Biophys Acta **1180**(2): 147-162.

9. Lichtenstein, A. H., L. J. Appel, et al. (2006). "Summary of American Heart Association Diet and Lifestyle Recommendations revision 2006." Arterioscler Thromb Vasc Biol **26**(10): 2186-2191.
10. Liu, R., D. Xing, et al. (2006). "Pharmacokinetics of puerarin and ginsenoside Rg1 of CBN injection and the relation with platelet aggregation in rats." Am J Chin Med 34(6): 1037-1045.
11. Michiels, J. J., J. Abels, et al. (1985). "Erythromelalgia caused by platelet-mediated arteriolar inflammation and thrombosis in thrombocythemia." Ann Intern Med 102(4): 466-471.
12. Navarro-Nunez, L., M. L. Lozano, et al. (2008). "Apigenin inhibits platelet adhesion and thrombus formation and synergizes with aspirin in the suppression of the arachidonic acid pathway." J Agric Food Chem **56**(9): 2970-2976.
13. Poirier, P., T. D. Giles, et al. (2006). "Obesity and cardiovascular disease: pathophysiology, evaluation, and effect of weight loss: an update of the 1997 American Heart Association Scientific Statement on Obesity and Heart Disease from the Obesity Committee of the Council on Nutrition, Physical Activity, and Metabolism." Circulation **113**(6): 898-918.
14. Tefferi, A. (2012). "Polycythemia vera and essential thrombocythemia: 2012 update on diagnosis, risk stratification, and management." American Journal of Hematology 87(3): 284-293.
15. Vladareanu (2010). "Molecular markers guide diagnosis and treatment in Philadelphia chromosome-negative myeloproliferative disorders (Review)." Oncology Reports **23**(3).
16. Waskiewicz, A., W. Piotrowski, et al. (2008). "Quality of nutrition and health knowledge in subjects with diagnosed cardio-vascular diseases in the Polish population--National Multicentre Health Survey (WOBASZ)." Kardiol Pol **66**(5): 507-513, discussion 514.

# INVESTIGATION OF ACCURACY OF THE NEWEST FUNCTION APPROXIMATION FOR THE FORCE GENERATED BY PNEUMATIC ARTIFICIAL MUSCLE

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## ABSTRACT

The newest and most promising type of pneumatic actuators is the pneumatic artificial muscle (PAM). Different designs have been developed, but the McKibben muscle is the most popular and is made commercially available by different companies (e. g. Fluidic Muscle manufactured by Festo Company). The most often mentioned characteristic of PAMs is the force as a function of pressure and contraction. In this paper our newest function approximation for the force generated by Fluidic Muscles is shown that can be generally used for different muscles made by Festo Company.

## 1. INTRODUCTION

Pneumatic artificial muscle is a membrane that will expand radially and contract axially when inflated, while generating high pulling force along the longitudinal axis. PAMs have different names in literature: Pneumatic Muscle Actuator, Fluid Actuator, Fluid-Driven Tension Actuator, Axially Contractible Actuator, Tension Actuator, etc. ([1] and [2]).

The working principle of pneumatic muscles is well described in [1], [2], [3], [4] and [5].

There are a lot of advantages of PAMs like the high strength, good power-weight ratio, low price, little maintenance needed, great compliance, compactness, inherent safety and usage in rough environments ([4] and [6]). The main disadvantage of these muscles is that their dynamic behaviour is highly nonlinear ([4], [7], [8], [9], [10] and [11]).

Many researchers have investigated the relationship of the force, length and pressure to find a good theoretical approach for the equation of force produced by pneumatic artificial muscles. Some of them report several mathematical models, but significant differences have been noticed between the theoretical and experimental results ([4], [6], [12], [13] and [14]). [15] proves the accuracy of fitting using mathematical method of statistics (correlation index R = 0.998-0.999), only, but it is valid for SAM (Shadow Air Muscle) made by Shadow Robot Company.

The force depends on length (contraction) under constant pressure. This force decreases with increasing position of the muscle and the muscle inflates. Our goal was to develop a precise approximation algorithm with minimum numbers of parameters for the force of different Fluidic Muscles.

The layout of this paper is as follows. Section 2 (Materials and Methods) presents the static modelling of PAMs and several force equations. Section 3 (Results and Discussion) compares the measured and calculated data. Finally, Section 4 (Conclusion and Future Work) gives the investigations we plan.

Fluidic Muscle type DMSP-20-400N-RM-RM (with inner diameter of 20 mm and initial length of 400 mm) produced by Festo Company is selected for our newest study (Figure 1).


**Fig. 1. Festo Fluidic Muscles**

## 2. MATERIALS AND METHODS

The general behaviour of PAMs with regard to shape, contraction and tensile force when inflated depends on the geometry of the inner elastic part and of the braid at rest (Figure 2), and on the materials used [1]. Typical materials used for the membrane construction are latex and silicone rubber, while nylon is normally used in the fibres. Figure 3 shows the materials of Fluidic Muscles.

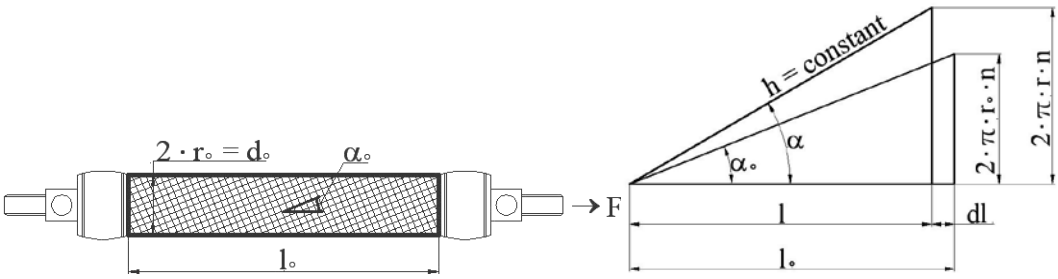


**Fig. 2. Geometry parameters of PAMs**

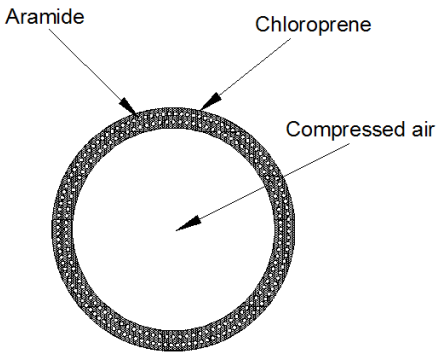


**Fig. 3. Materials of Fluidic Muscles**

With the help of [4] and [6], the input and output (virtual) work can be calculated:

$$dW_{in} = p \cdot dV \tag{1}$$

$dW_{in}$ can be divided into a radial and an axial component:

$$dW_{in} = 2 \cdot r \cdot \pi \cdot p \cdot l \cdot (+dr) - r^2 \cdot \pi \cdot p \cdot (-dl) \tag{2}$$

The output work:

$$dW_{out} = -F \cdot dl \tag{3}$$

By equating the virtual work components:

$$dW_{in} = dW_{out} \tag{4}$$

Using (1) and (3):

$$F = -p \cdot \frac{dV}{dl} \tag{5}$$

Using (2) and (3):

$$F = -2 \cdot r \cdot \pi \cdot p \cdot l \cdot \frac{dr}{dl} - r^2 \cdot \pi \cdot p \tag{6}$$

On the basis of Figure 2:

$$\cos\alpha_0 = \frac{l_0}{h} \text{ and } \cos\alpha = \frac{l}{h} \tag{7}$$

$$\sin\alpha_0 = \frac{2 \cdot \pi \cdot r_0 \cdot n}{h} \text{ and } \sin\alpha = \frac{2 \cdot \pi \cdot r \cdot n}{h} \tag{8}$$

$$\frac{l}{l_0} = \frac{\cos\alpha}{\cos\alpha_0} \text{ and } \frac{r}{r_0} = \frac{\sin\alpha}{\sin\alpha_0} \tag{9}$$

$$r = r_0 \cdot \frac{\sqrt{1-\cos^2\alpha}}{\sin\alpha_0} = r_0 \cdot \frac{\sqrt{1-\left(\frac{l}{l_0}\cdot\cos\alpha_0\right)^2}}{\sin\alpha_0} \tag{10}$$

$$\frac{dr}{dl} = -\frac{r_0 \cdot l \cdot \cos^2\alpha_0}{l_0^2 \cdot \sin\alpha_0} \cdot \frac{1}{\sqrt{1-\left(\frac{l}{l_0}\cdot\cos\alpha_0\right)^2}} \tag{11}$$

By using (10) and (11) with (6) the force equation is found:

$$F(p,\kappa) = r_0^2 \cdot \pi \cdot p \cdot (a \cdot (1-\kappa)^2 - b) \tag{12}$$

Where $a = \frac{3}{tg^2\alpha_0}$, $b = \frac{1}{\sin^2\alpha_0}$, $\kappa = \frac{l_0 - l}{l_0}$, $0 \le \kappa \le \kappa_{max}$, and $V$ the muscle volume, $F$ the pulling force, $p$ the applied pressure, $r_0$, $l_0$, $\alpha_0$ the initial inner radius and length of the PAM and the initial angle between the thread and the muscle long axis, $r$, $l$, $\alpha$ the inner radius and length of the PAM and angle between the thread and the muscle long axis when the muscle is contracted, $h$ the constant thread length, $n$ the number of turns of thread and $\kappa$ the contraction.

Consequently:

$$F_{max} = r_0^2 \cdot \pi \cdot p \cdot (a - b), \text{ if } \kappa = 0 \tag{13}$$

and

$$\kappa_{max} = 1 - \sqrt{\frac{b}{a}}, \text{ if } F = 0 \tag{14}$$

Equation (12) is based on the admittance of a continuously cylindrical-shaped muscle. The fact is that the shape of the muscle is not cylindrical on the end, but rather is flattened, accordingly, the more the muscle contracts, the more its active part decreases, so the actual maximum contraction ration is smaller than expected [4].
Tondu and Lopez in [4] consider improving (12) with a correction factor $\varepsilon$, because it predicts for various pressures the same maximal contraction. This new equation is relatively good for higher pressure ($p \ge 200$ kPa). Kerscher et al. in [13] suggest achieving similar approximation for smaller pressure another correction factor $\mu$ is needed, so the modified equation is:

$$F(p,\kappa) = \mu \cdot r_0^2 \cdot \pi \cdot p \cdot (a \cdot (1-\varepsilon\cdot\kappa)^2 - b) \tag{15}$$

Where $\varepsilon = a_\varepsilon \cdot e^{-p} - b_\varepsilon$ and $\mu = a_\kappa \cdot e^{-\kappa \cdot 40} - b_\kappa$.

Significant differences between the theoretical and experimental results using (12) and (15) have been proved in [16] and [17]. To eliminate the differences new approximation algorithms with six and five unknown parameters have been introduced for the force generated by Fluidic Muscles:

$$F(p,\kappa) = (a \cdot p + b) \cdot e^{c \cdot \kappa} + d \cdot p \cdot \kappa + e \cdot p + f \tag{16}$$

$$F(p,\kappa) = (p + a) \cdot e^{b \cdot \kappa} + c \cdot p \cdot \kappa + d \cdot p + e \tag{17}$$

(16) can be generally used with high accuracy for different Fluidic Muscle independently from length and diameter under different values of pressure and (17) can be used with high accuracy for Fluidic Muscle with inner diameter of 20 mm, only.

The unknown parameters of (16) (a, b, c, d, e and f) and (17) (a, b, c, d and e) can be found by Solver in MS Excel 2010.

## 3. RESULTS AND DISCUSSION

Our newest analyses were carried out in MS Excel. Tensile force of Fluidic Muscle under different constant pressures is a function of muscle length (contraction). The force always drops from its highest value at full muscle length to zero at full inflation and position (Figure 4).

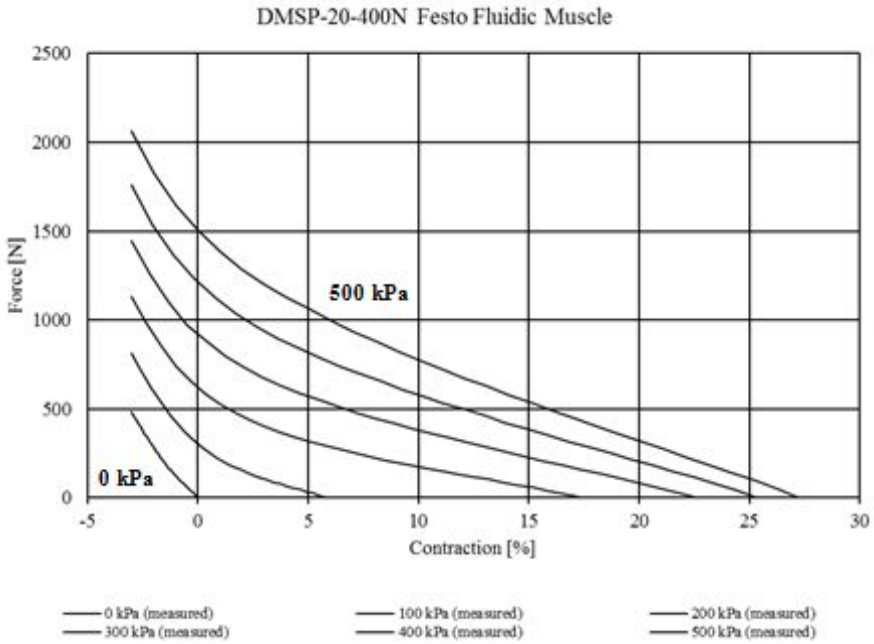


**Fig. 4. Isobaric force-contraction diagram**

Firstly, the measured data and calculated data using (12) were compared. As it is shown in Figure 5, there is only one intersection point between the measured and calculated results and no fitting.

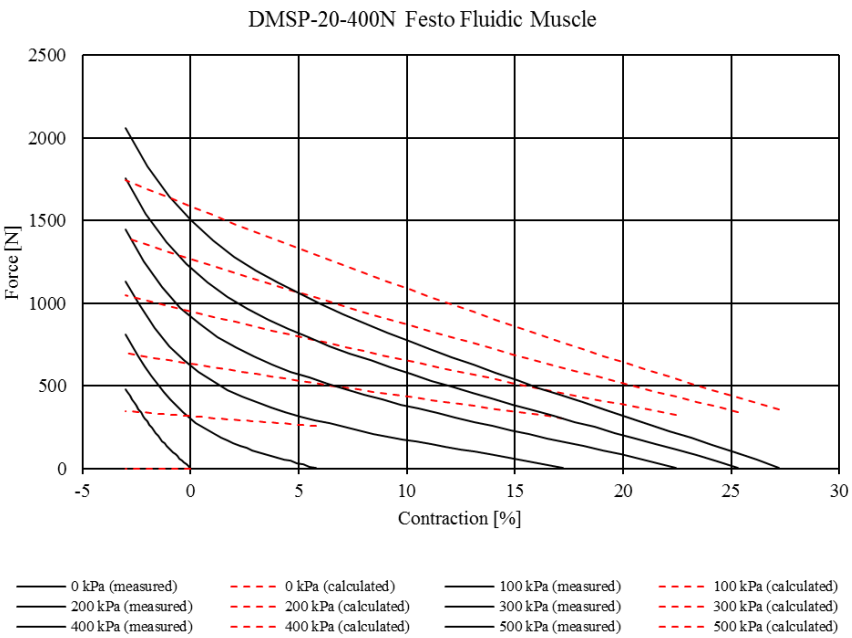


**Fig. 5. Comparison of measured data and calculated data using (12)**

$R^2 = 0.6165 \rightarrow R = 0.7852$ correlation index proves the inaccurate fitting for the measured data (Figure 6).

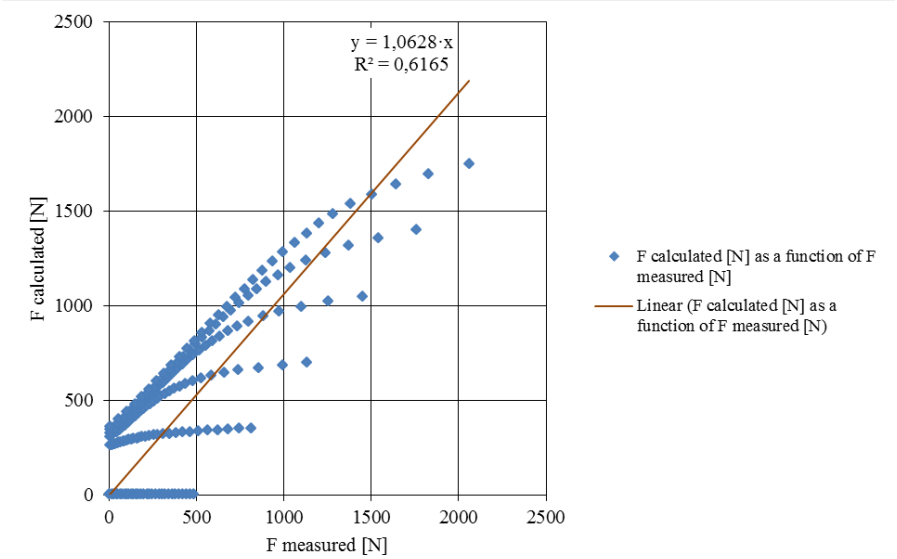


**Fig. 6. Relationship between the measured force and calculated force using (12)**

In the interest of fitting the simulation was repeated with (15) (Figure 7). The coefficients ($a_\kappa$, $b_\kappa$ $a_\varepsilon$, and $b_\varepsilon$) of (15) were found using Solver in MS Excel. Values of unknown parameters of (15) are listed in Table 1.

**Table 1. Values of unknown parameters of (15)**

| Parameters | Values |
|---|---|
| $a_\kappa$ | 0,076042885 |
| $b_\kappa$ | -0,502357905 |
| $a_\varepsilon$ | 9,74938E+28 |
| $b_\varepsilon$ | -2,801103661 |

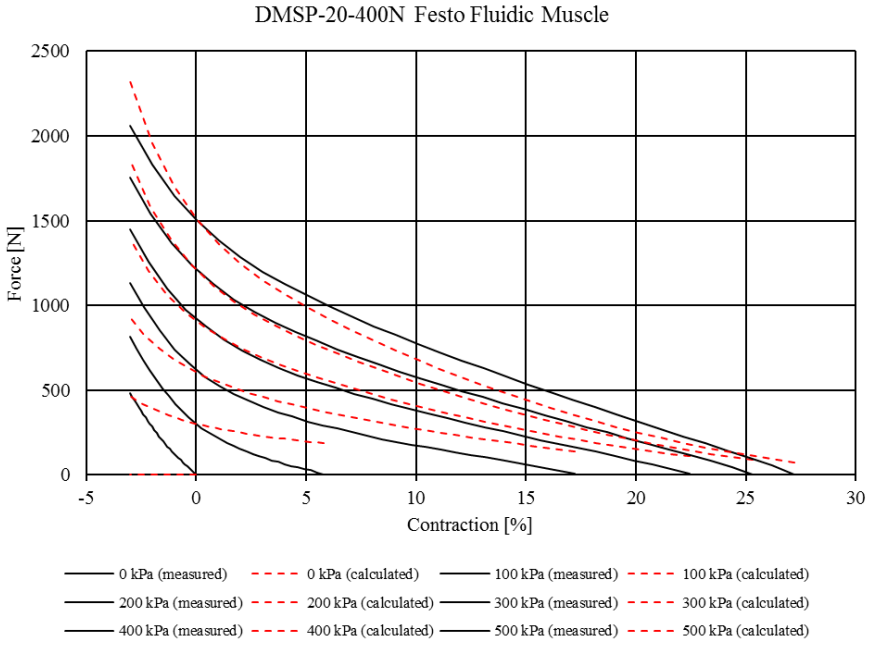


**Fig. 7. Comparison of measured data and calculated data using (15)**

Figure 7 shows the measured and calculated results still do not fit. Better fitting was attained, but at a pressure of 0 kPa we still have a rather substantial inconsistency. This inconsistency can be seen in Figure 8.

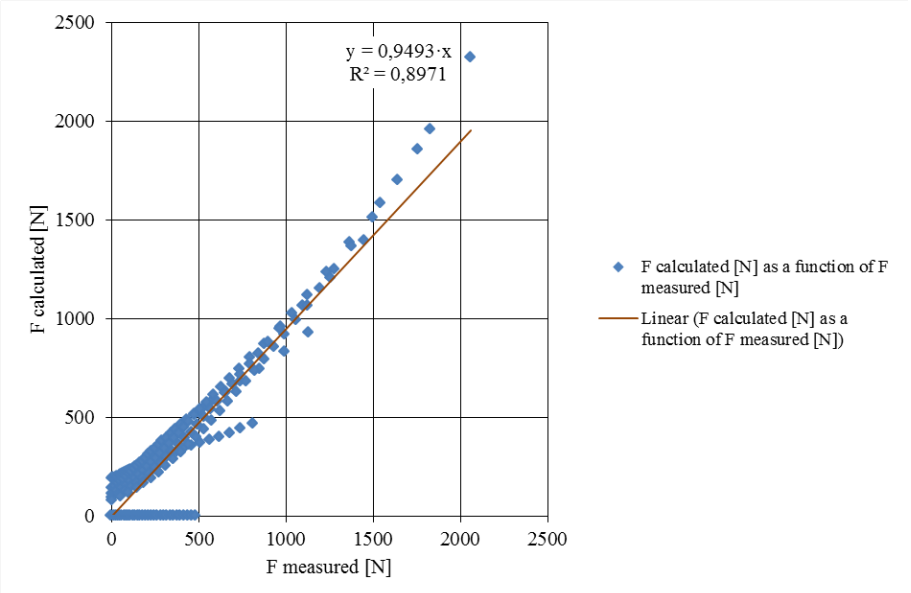


**Fig. 8. Relationship between the measured force and calculated force using (15)**

To improve fitting quality under different values of pressure including 0 kPa new approximation algorithms have been introduced with 6 and 5 parameters. The unknown parameters of (16) and (17) can be found using Solver in MS Excel, too. Values of these unknown parameters are shown in Table 2. and Table 3.

**Table 2. Values of unknown parameters of (16)**

| Parameters | Values |
|---|---|
| a | -4,35572689 |
| b | 281,2237983 |
| c | -0,32866293 |
| d | -9,27034945 |
| e | 302,2010663 |
| f | -263,691854 |

**Table 3. Values of unknown parameters of (17)**

| Parameters | Values |
|---|---|
| a | 274,7944784 |
| b | -0,32623809 |
| c | -9,07369264 |
| d | 296,3161465 |
| e | -254,042387 |

The accurate fitting of (16) and (17) can be seen in Figure 9 and Figure 10.

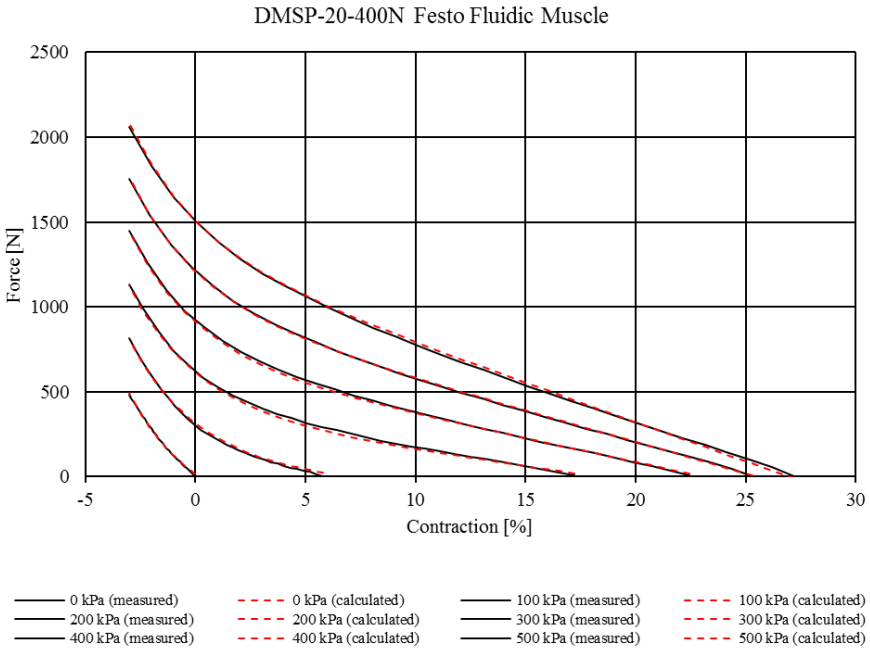


**Fig. 9. Comparison of measured data and calculated data using (16)**

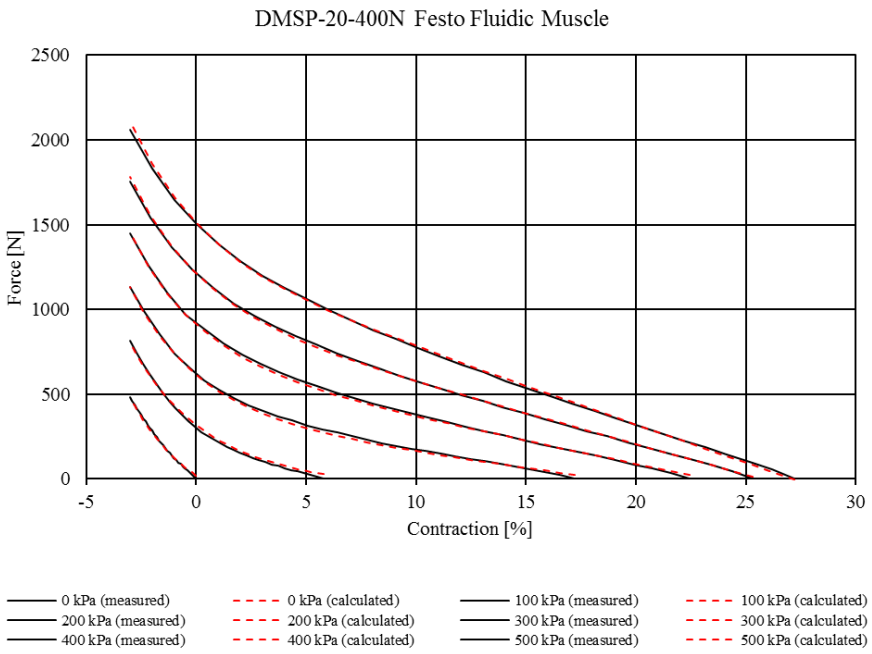


**Fig. 10. Comparison of measured data and calculated data using (17)**

As we can see we have consistent fitting even at a pressure of 0 kPa.

Figure 11 and Figure 12 illustrate the relationship between the measured force and calculated force. The $R^2 = 0.9995 \rightarrow R = 0.9997$ correlation index and $R^2 = 0.9993 \rightarrow R = 0.9996$ correlation index prove the tight relationship between them.

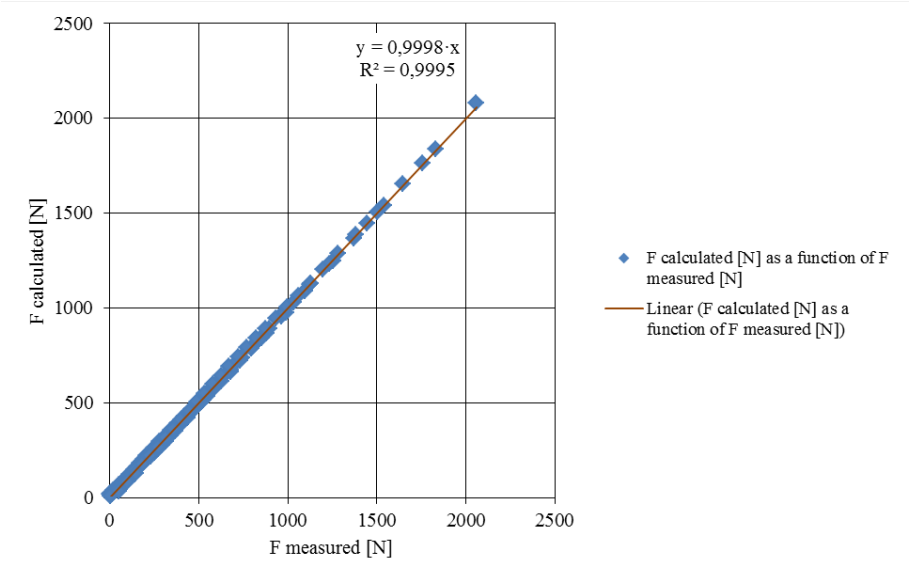


**Fig. 11. Relationship between the measured force and calculated force using (16)**

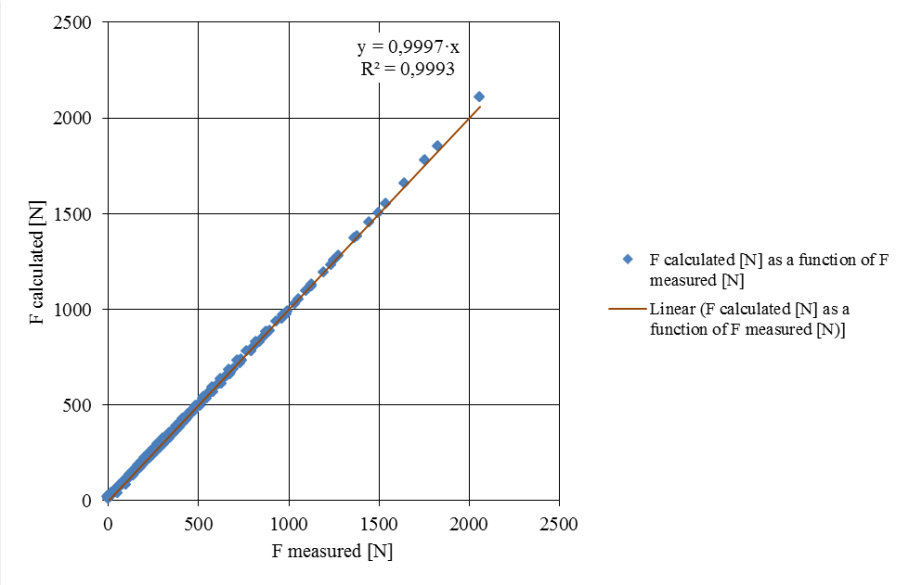


**Fig. 12. Relationship between the measured force and calculated force using (17)**

## 4. CONCLUSION AND FUTURE WORK

In this work new functions for the force generated by Festo Fluidic Muscle were introduced and the accuracy of these approximation algorithms was proved. The investigations were carried out in MS Excel environment. Our main aim is to develop a new general mathematical model for pneumatic artificial muscles applying our new models and results.

## REFERENCES

1. Daerden, F. (1999): Conception and Realization of Pleated Artificial Muscles and Their Use as Compliant Actuation Elements. PhD Dissertation, Vrije Universiteit Brussel, Faculteit Toegepaste Wetenschappen Vakgroep Werktuigkunde, 5-24 p.
2. Daerden, F., Lefeber, D. (2002): Pneumatic Artificial Muscles: Actuator for Robotics and Automation. European Journal of Mechanical and Environmental Engineering, 2002:47, 10-21 p.
3. Caldwell, D. G., Razak, A., Goodwin, M. J. (1993): Braided Pneumatic Muscle Actuators. Proceedings of the IFAC Conference on Intelligent Autonomous Vehicles, Southampton, United Kingdom, 18-21 April, 1993, 507-512 p.
4. Tondu, B., Lopez, P. (2000): Modelling and Control of McKibben Artificial Muscle Robot Actuator. IEEE Control System Magazine, 2000:20, 15-38 p.
5. Balara, M., Petík, A. (2004): The Properties of the Actuators with Pneumatic Artificial Muscles. Journal of Cybernetics and Informatics, 2004:4, 1-15 p.
6. Chou, C. P., Hannaford, B. (1996): Measurement and Modeling of McKibben Pneumatic Artificial Muscles. IEEE Transactions on Robotics and Automation, 1996:12 (1), 90-102 p.
7. Caldwell, D. G., Medrano-Cerda, G. A., Goodwin M. (1995): Control of Pneumatic Muscle Actuators. IEEE Control System Magazine, 1995:15 (1), 40-48 p.
8. Lamár, K. (2004): Inaccuracies in Digitally Controlled Induction Motor Drives. 21st Joint Scientific Conference „Science for Practice", Subotica, Serbia, 4-6 May, 2004, 33-41 p.
9. Tian, S., Ding, G., Yan, D., Lin, L., Shi, M. (2004): Nonlinear Controlling of Artificial Muscle System with Neural Networks. International Conference on Robotics and Biomimetics, Shenyang, China, 22-26 August, 2004, 56-59 p.

10. Udawatta, L., Priyadarshana, P., Witharana, S. (2007): Control of Pneumatic Artificial Muscle for Bicep Configuration using IBC, Third International Conference on Information and Automation for Sustainability, Melbourne, VIC, Australia, 4-6 December, 2007, 35-39 p.
11. Situm, Z., Herceg, Z. (2008): Design and Control of a Manipulator Arm Driven by Pneumatic Muscle Actuators. 16th Mediterranean Conference on Control and Automation, Ajaccio, France, 25-27 June, 2008, 926-931 p.
12. Yee, N., Coghill, G. (2002): Modelling of a Novel Rotary Pneumatic Muscle, Australiasian Conference on Robotics and Automation, Auckland, New Zealand, 27-29 November, 2002, 186-190 p.
13. Kerscher, T., Albiez, J., Zöllner, J. M., Dillmann, R. (2005): FLUMUT - Dynamic Modelling of Fluidic Muscles using Quick-Release, 3rd International Symposium on Adaptive Motion in Animals and Machines, Ilmenau, Germany, 25-30 September, 2005, 1-6 p.
14. Ramasamy, R., Juhari, M. R., Mamat, M. R., Yaacob, S., Mohd Nasir, N. F., Sugisaka, M. (2005): An Application of Finite Element Modeling to Pneumatic Artificial Muscle, American Journal of Applied Sciences, 2005:2 (11), 1504-1508 p.
15. Borzikova, J., Balara, M., Pitel, J. (2007): The Mathematical Model of Contraction Characteristic $k = (F, p)$ of the Pneumatic Artificial Muscle, XXXII. Seminar ASR '2007 "Instruments and Control", Farana, Smutný, Kočí & Babiuch, Ostrava, 2007, 21-25 p.
16. Sárosi, J. and Fabulya, Z. (2012): New Function Approximation for the Force Generated by Fluidic Muscle, International Journal of Engineering, Annals of Faculty of Engineering Hunedoara, 2012:10 (2), 105-110. p.
17. Sárosi, J., Fabulya, Z., Szabó, G. and Szendrő, P. (2012): Investigations of Precise Function Approximation for the Force of Fluidic Muscle in MS Excel, Review of Faculty of Engineering (International Conference on Science and Technique in the Agri-Food Business, ICoSTAF 2012), 2012:3-4, 1-8. p

# CORPORATE CULTURE – ITS ROLE, POSITION AND PROBLEMS IN BUSINESS

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## ABSTRACT

Numerous articles, publications and researches show a strong impact of a good corporate culture on business success and economic performance. A strong corporate culture can be responsible for the process of creation of internal organization values, and it can also influence the proper functioning of the company and even its competitiveness. In those companies, that recognize the importance of corporate culture, corporate culture can become the most important tool, which can help them to achieve their strategic objectives. According to opinions of some authors, an excellent corporate culture is “the spirit” of organization. It is a part of entrepreneur’s core competitiveness but also it is a bas of core competencies. The present article is focused on identification and evaluation of problems during the forming process of corporate culture. The identification of problems was realized through questionnaire at the sample of 130 respondents. The result of the research shows that certain issues such as "*buying your own people*" (69% of respondents believe that remuneration is unfair), *"sanctions"* (more than ¼ of respondents think that work environment is not open for new ideas) or "*copying of culture*" (almost ¼ of respondents answered that they do not feel comfortable in existing culture) are still appearing in the shaping of corporate culture of companies.
*Key words: Corporate culture, competitiveness, competitive advantage*

## 1. INTRODUCTION

The term or better said the topic of Corporate culture is so called „hot“ theme, which has become intensively studied, analyzed and used only in last few decades. The reason is simple; managers realize the need of a corporate culture, which is one of the most important factors in companies live. This is given by the strong link between organizational culture and organizational performance and competitiveness- bureaucratic control could only buy employees bodies, but not their hearts. A strong organizational culture, however, can be a primary generator of real motivation and commitment. In a strong and cohesive culture, the organizations core values are both, intensely held and widely shared. This high intensity of common beliefs makes it relatively easier to draw consensus among employees, to build a focus on important goals and objectives, to reduce potential conflicts, to cultivate a learning environment, and to lower staff turnover. A strong culture has a unique absorptive power to congregate people. Employees no longer need to be compelled to work hard, but do so willingly. They identify themselves with their organization, just as they do with their families and communities. According to Straub-Bauer (2005) this means that *”on one hand organizational culture influences what organizational members think about knowledge sharing and how they subconsciously behave in relation to it, and on the other one, through certain organizational practices, it influences directly knowledge sharing behavior.”*

## 2. OBJECTIVE AND METHODS

The aim of the article was to identify and evaluate problems in shaping the corporate culture in a selected group of companies.

The research was conducted by a questionnaire and personal interview of a sample of ten commercially- oriented companies. The questionnaire consisted of

fifteen questions, which were structured as closed, so that the respondents (total number of respondents was 130) had the opportunity to a multiple choice.

The questionnaire was evaluated by using contingency tables, which were prepared by Excel, under which they were subsequently developed graphic representations.

## 3. RESULTS

Numerous researchers have defined organizational culture, but the well known and mostly used definition is that one given by *Schein* (1992), which says, that corporate culture is "*a pattern of shared basic assumptions that the group learned as it solved its problems that has worked well enough to be considered valid and is passed on to new members as the correct way to perceive, think, and feel in relation to those problems."* Some authors like for example *Brooks* (2003), *Šigut* (2004), or *Bono & Heller* (2006) agree with this definition, but they complement it with an opinion, which says that corporate culture is often regarded as responsible for a variety of organizational problems and occasionally it attaches the creation of positive qualities.

In general we can say that corporate culture is an essential and indispensable part of business, which is reflected in the serious situations as well as those less. For this, but of course for many other reasons is this term becoming much more and thoroughly studied, because it is necessary to understand the behavior of business and identify and explain organizational issues and activities.

According to *Armstrong Consulting Competence* research (2010) which was conducted on a sample of Czech and Slovak companies, almost a fifth of employee performance is explained by differences in corporate culture. The research focused on several indicators, such as Identification Index, which proved to be the strongest predictor of business results and explains between 13-25% of the variability of business results, further information saturation of 27-33% and 19-30% self-realization. Perceived behavioral consistency to employees is explained by 14-27% of business results, and performance management, which dominates the space for pro-activity of 12-38%. The impact of the positive characteristics of corporate culture on business results is immediate. The increase of identification and improvement of the characteristics of leadership style is reflected in customer satisfaction, according to the results, typically after twelve, in some cases up to eighteen months. The impact on customer satisfaction demonstrated by their awareness of changes in the behavior of employees is delayed, and premises a long-term operation of high-quality suppliers.

An interesting example of a strong corporate culture is the Japanese company Toyota. The competitive advantage of this company is based on corporate philosophy known as the Toyota Production System. This partly depends on human resources management policy that stimulates employee creativity and loyalty, but also depends on a highly efficient network of suppliers and component manufacturers. The average annual performance of the company is more than 700,000 improvement suggestions submitted by employees of Toyota. This represents an average of more than 10 suggestions per employee per year and more than 99% of the proposals are implemented.

### Corporate culture as a product

Many companies choose so called "best customer service" competitive strategy. Those companies need to build their internal culture to support the willingness of employees to benefit the customer. If it succeeds, the company sells more. So the culture to a customer receives a reward, and thus becomes a product.

In general, it is possible to specify the three generic competitive business strategies:

- "*price leader*" strategy - in this case, the company sells at a lower price than the competition, but the quality of products or services is the same one. If a company chooses this strategy requires a highly productive production process and low cost labor. In this case, is appropriate if the corporate culture is at first process- oriented and just then profit or loss-oriented. This strategy was successfully selected by many air carriers, for example by Slovak Airlines.
- *"best service"* strategy - this strategy is a situation where the company examines the needs of specific customers and satisfies them better than competitors. That is why it is necessary for employees to build a full understanding of the objectives of the company and ask them to meet customer expectations. In this case is appropriate if the corporate culture is at first profit or loss-oriented, so that everyone had done everything what is needed to satisfy customer needs. This strategy is mostly used by service companies, like for example banks, restaurants, or car companies.
- "*product leader"* strategy – this strategy is typical for those companies, which are providing products with better parameters as competition. For this reason, company elects agents capable for creating new products, innovating them and to compete to existing products. They need freedom, space, the atmosphere of creativity and confidence. This can be achieved only in the result-oriented corporate culture, because creative people are intolerant to restriction given by the rules and do not recognize "authorities" (see Figure 1). The claim was confirmed by a research in selected companies, where the result was that only 52% of respondents prefer to work independently without an influence of other people, and only 7% of them prefer a direct line manager. Further 5% of respondents would like to see work as a couple and the last 36% would prefer to work in creative groups. This strategy is used by suppliers of technologically oriented market like photo, video, IT.

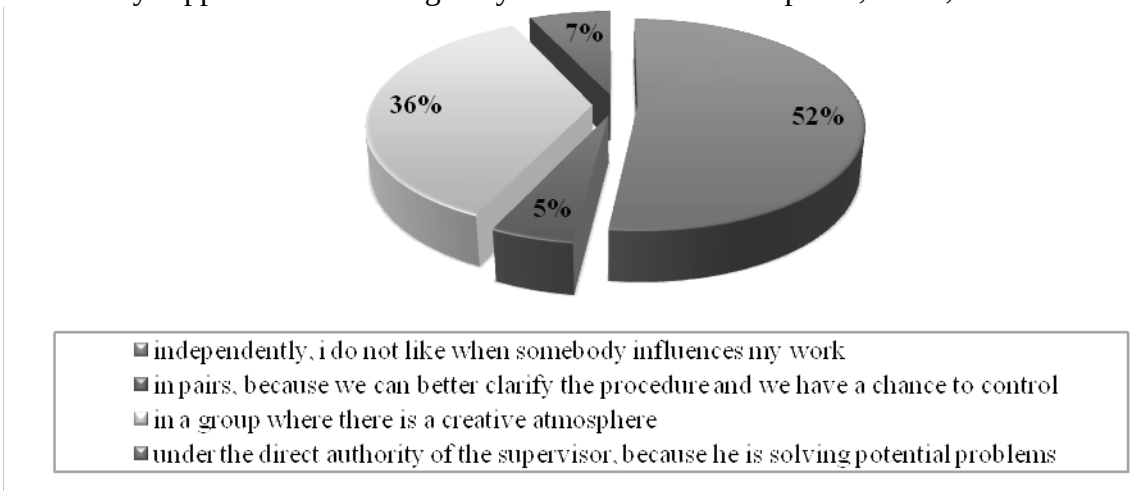


**Fig. 1. You better like to work**
Source: Own processing of

The decision depends primarily on the customs of the market, on consumer expectations for the type of product, but also on the company's potential. The company usually needs to implement only one competitive strategy. If the company decides to combine the "price leader" strategy with the "best service" strategy, it will probably end up with a higher price than specialists in low prices and with worse service than specialists to meet customer expectations.

There are also few exceptions, which are manifested in those situations when the company operates in two different markets, but there is a risk that the value of the company brand is ideal only for the first market, but in the second one not. Then it is better to create two independent companies with different products, strategies, employees and different brand value.

**How can be corporate culture measured?**

Many authors as for example *Havrdová & col.* (2011), *Vysekalová & Mikeš* (2009), or *Burger* (2007) says that corporate culture is not just a "term", but also an indicator, which can be measured and evaluated. These mentioned authors also say, that there can be used not just quantitative, but also qualitative methods of measuring and when it is possible to base it on rules and standards embodied in the company, as well as on its strategic objectives in the field of human resources.

In general we can say that there are three basic possibilities of measuring corporate culture:

- Internal survey of corporate culture (questionnaires, interviews, focus groups)
- External Mystery-shopping or Mystery-calling (directly to the company and the customer interface)
- Combination of previous methods and correlation between the repeated shortcomings of several employees in touch with customers and faults in the corporate culture that they can cause.

There can be used any of explained methods, but it must bring the following information:

- How is the corporate culture oriented (in which proportion are the basic orientations – elements of authoritarian orientation, elements of process orientation, elements of the score orientation)?
- What are the positive elements supporting the competitiveness of the chosen business strategy?
- What are the negative elements of counter-strategies in terms of competitiveness?

**Problems in the process of influencing the corporate culture**

There are countless so-called pitfalls of that individual companies can in the process of influencing corporate culture run into. Investigation and monitoring practices allowed many professionals, respectively expert advisors to define (Ibis Partner Ireland, 2010) several basic and most important issues of which are selected as follows:

- *knowledge of context by the managers* - one of the biggest problems is that many managers do not know or incorrectly explain the concept of corporate culture. This suggests the result of research conducted on the sample of companies (see Figure 2).

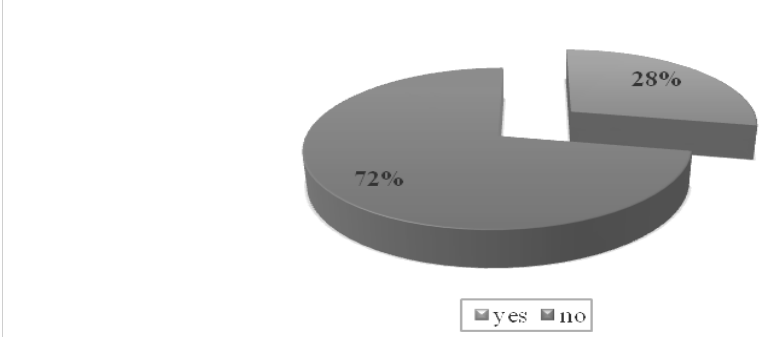


**Fig. 2. Do you know what does the concept corporate culture mean?**
Source: Own processing of

As the answers represent us, this problem of ignorance still resonates in many companies. Up to 72% of respondents do not have a clear understanding of the concept of corporate culture, which is very often wrongly associated only with a decent human behavior and culture of the environment. Some managers said about corporate culture that they "have given traders sewed uniforms." Conversely, other and more serious problem is that companies do not have clarified their corporate culture. There is given a simple solution consisting of two steps, namely:

- *The first step*- finding that the organization has fully clarified its position and orientation in the environment,
- *The second step*- an informative managerial seminar about corporate culture for the unification of information.

▪ *creating a project* - project is in general a document, which captures some goals that should be in company culture achieved, but not universally applicable principles applicable in any business. Nevertheless, its development and preparation is important because it is a non-trivial, closed content and time-limited role. In none of the investigated companies, is designed a project just for the corporate culture. They are just trying to download it from their parent companies. In preparing the project are recommended some basic steps that enterprises should use:

- summarize the objectives, external conditions and internal state of the current business
- propose desirable design of the corporate culture,
- examine the real state of the corporate culture,
- determine significant differences that need to be targeted to remove
- prepare a plan of action to achieve goals.

▪ *inappropriateness of coping* – this is an important and not less accentuation term in the concept of corporate culture, which follows to the process of project. Corporate culture must be in accordance with the nature of production. Other corporate culture meets industry and other such, which provides services. In addition, it must respect the market position of company, its target audience and image. That is not a rare problem when so called copied corporate culture of one company is violently enforced in another company, as in 8 out of 10 monitored companies, what often tends to have precisely the opposite effect as was the desired one (see Figure 3).

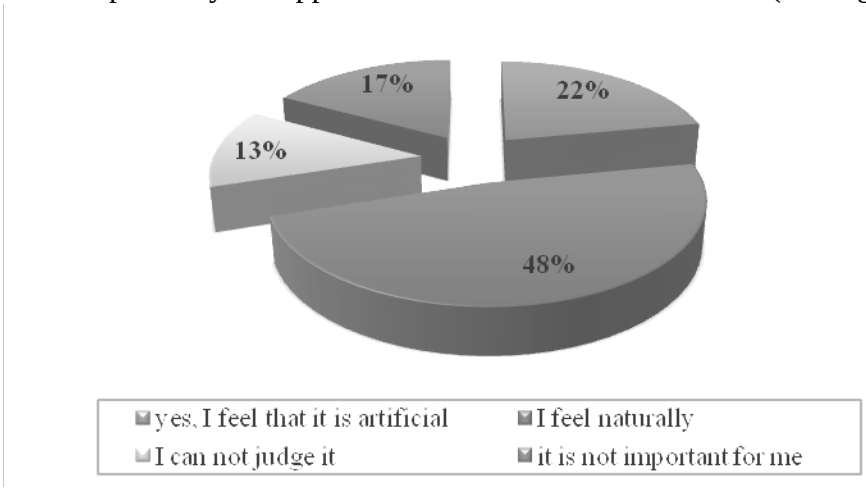


**Fig. 3. Do you feel in your business naturally, or you feel like your corporate culture was spurious?**

Source: Own processing of

This problem, as the research shows, is in selected companies slowly eliminated, where only 48% of respondents feel themselves in their corporate culture naturally, despite the fact that this culture is taken over the parent company, but is adapted to domestic conditions. However, it is still not completely overcome as it is clear from the figure where 22% of respondents still have unfavorable feelings connected with their corporate culture. As an example can be used a situation when one of the managers modified his facilities the same way as western companies to support employees identification with the environment and business. The result was a decline in consumer interest. The solution to this problem could be the negotiation of chosen strategy with their clients due to the creation of the desired profile of the corporate culture.

▪ *remove the ideal vision* - a frequent occurrence in the corporate practice is a transmission of the faith of their own business in their own decision-making process. As an example of this claim is suitable the following situation- a director from an unnamed company felt concerned when it was reported him the observations of their environment. He claimed that his company is doing much better than it was expressed by the experts. Years of experience show that the actual profile of the corporate culture is normally worse than senior managers think, but better as it say the lower levels of the organization. As a solution is offered a basic idea, that the real situation in a particular organization may be different from the preliminary assumptions.

▪ *respect the objective findings* – this is a matter of all members of the organization and on the other hand, it is a perceived and not codified state in each organization. The tool which is supporting this claim is usually a questionnaire survey of the various elements of corporate culture and personal interview for selected samples of various job categories. In practice, it runs as follows- the customer receives not just the report about the findings, but also cross-correlations of the various layers business views on the same issue. Subsequently, the findings are interpreted to identify causation.

▪ *do not regulate culture changes*- after finding the difference between the desired and actual state of corporate culture, managers tend to do so- called immediate action to correct. A good example for this case is the one director, who was trying to put together a set of regulations, that have to put any differences in a particular order, what, when, where and how it has to be changed. This measure would be triggered only climate change, which leads to the expression, because the change in corporate culture responds to a causal rather than symptomatic treatment. A good solution in this case is a meeting, better said conversation with outside counsel, it is necessary to pass the context and ask the same question: "What is due to our people ...“Up to a set of causal relationships can be taken an adequate measure. For example: "Our people refuse the possibility to decide themselves." Suspected cause: "They know that they need to learn or change." The real cause: "Managers complain, respectively punishable the unsuccessful decisions, but they do not reward the successful." Many employees are not combined with this approach, or better said they are combined with in only to a certain extent (see Figure 4). Despite to the previous results where only 22% of respondents do not feel naturally in the corporate culture of their organization, here only 26% would be willing to undergo a change in exceptional circumstances and 53% would not be willing to undergo a culture change at all. Only 5% believe that culture should be checked and changed continuously.

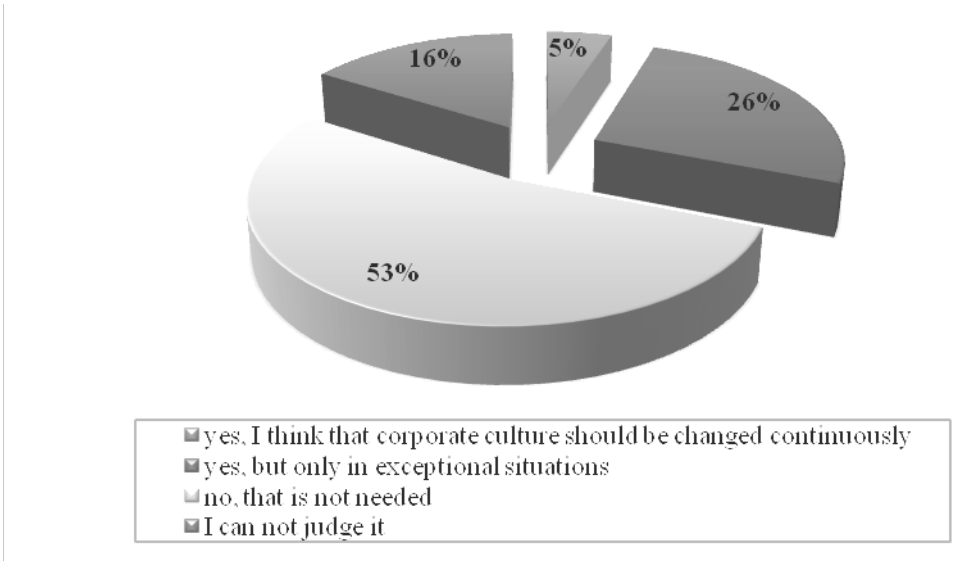


**Fig. 4.** Do you think, that it is necessary to change your corporate culture?
*Source:* Own processing of

▪ *do not penalize* - if there are made penalties for differences in expression of the desired corporate culture, it is reached just a formal conformance and not an internal attitude. As an example, can be used any situation where the departure of a worker is interpreted as a gaffe to the loyalty to the employer. Of damage to the internal climate of a "de facto" spreading negative references in the external environment. In this case is the solution same one as it was explained in the previous paragraph. However, this problem is in reported companies, according to the research, tending to a positive development. As it is graphically shown in Figure 5 70% of respondents think that their working environment is open to creative approaches. On the other hand, more than a third of them still think that, after expressing their own opinion, they will become in some way disadvantaged.

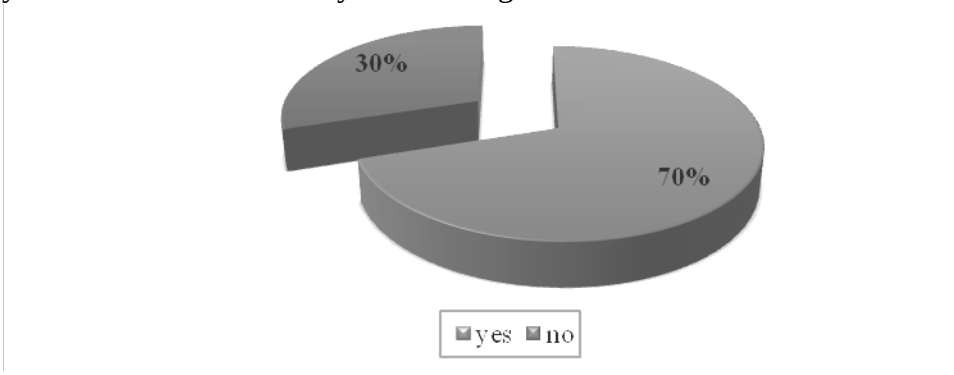


**Fig. 5. Do you think that your work environment is open to creative approaches?**
Source: Own processing of

▪ *do not buy your own people* - in many professional articles and publications can be detected managers' tendency to reward better those people/ employees who are conform to the declared corporate culture (see Figure 6). The research confirmed that employees of selected companies see this as a current problem (almost 69% of them think the compensation is not fair).

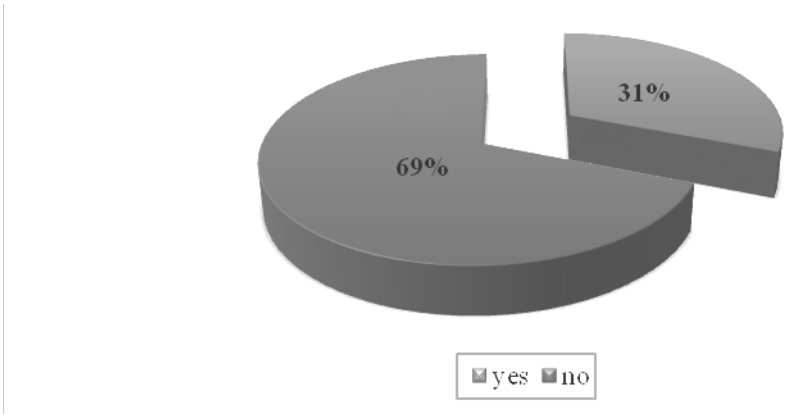


**Fig. 6. Do you think that the remuneration by manager is fair?**
Source: Own processing of

▪ *do not produce a campaign* - a campaign seems like a short term solution, which efforts after some time passes. It is a long-term role which is trespassing into the value orientation and the development of the organization, therefore it is necessary to create a project and capture the entire organization in the longer term.
▪ *Involvement of us* - the top level managers can not be missing if it is necessary to make a change in corporate culture. It is also important to develop a program of building a desirable profile of corporate culture, identify yourselves with him and become a leader of changes.
▪ *creating a "gravity" environment* - the change in corporate culture must be managed like any other change, it is also important to count with an inertia, misunderstanding and resistance, as it is with any change. This is why it is necessary to create an environment that will include acceleration features, opportunities to communicate and explain, motivate people and eliminate the resistance. In this environment can be things in motion, conformal values in one direction and non-conforming bubbles in other directions.
▪ *Involvement of the management*- the change of corporate culture is the most challenging and also in many cases, the least thing. Many authors argue that corporate culture can be managed and changed only to a certain extent and then only partially and slowly. They also say that if the company has decided to change the corporate culture, it must seek for allies rather than for critics. Managers must take care and not let lower managers affect things before they are aware of the changes, that they want them and can make them. For this step is necessary to involve the middle and lower management already at the stage of thinking about the issue of corporate culture. They must be present at all stages of the project.
▪ *choose an external consultant*- an unnamed Italian company has a multi-day program, but usually they also invite external consultants and advisors, not because the "cobbler" did not make the shoes themselves, but because there can be seen things differently and better from a different side. It's a question of another point of view, but also know-how and experience. It is therefore necessary to find an external supplier who is able to assist in all phases of project identification and possible modification of the corporate culture.
▪ *use appropriate criteria for selection*- the possibility of creating a range of criteria which must external consultants satisfy, for example the oaring of know-how, length of the partnership, the suitability of the proposed procedure, guarantees of quality, price etc.

## 4. CONCLUSION

The result of the research shows that corporate culture is a mirror of corporate identity and an image of its maturity. It can be also understood as a number of rules and values which tell us how the company operates, communicates and which common values are in it recognized. A good corporate culture is simply that one, in which is the company successful in the process of meeting its objectives and employees needs. Creation as well as the change of corporate culture is not as easy as it seems. There are many steps that must be followed, rules that must be respected and of course many problems which must be managed and overcame. These are just few of many reasons why it is necessary to pay a higher attention to corporate culture especially to her impact on business, its effectiveness and competitiveness.

REFERENCES


1. BONO, E. - HELLER, R. 2006. Corporate culture. [online] [cited 2012-03-06] Available on the Internet: http://www.thinkingmanagers.com/business-management/corporate-culture.php
2. BROOKS, I. 2003. *Firemní kultura*. Brno: Computer Press, a.s., 2003, 296 p. ISBN 80-7226-763-9
3. BURGER, I. 2007. Podniková kultúra ako produkt. In *Manažér*, roč. 12, 2007, č.4, p. 2-6,
4. HAVRDOVÁ, Z. a kol. 2011. *Kultura organizace a supervize ve vzájemném působení*. Praha : Fakulta humanitních studií Univerzity Karlovy v Praze, 2011. 102 p. ISBN 978-80-8739-814-2
5. Ibis Partner Slovakia. 2011. [online] [cited 2012-10-10] Available on the Internet: <http://www.ibispartner.sk/>
6. KACHAŇÁKOVÁ, A. 2008. *Podniková kultúra*. Bratislava: Ekonóm, 2008, 103 p. ISBN 978-80-225-2424-7
7. MAHROKIAN S. & col. 2010. Corporate culture: a lasting competitiv advantage. In: *Review of Business Research.* Jan. 2010 Source Volume : 10. Source Issue: 1. ISSN: 154-2609
8. MIŽIČKOVÁ, Ľ - ŠAJBIDOROVÁ, M. – UBREŽIOVÁ, I. 2007. *Základy manažmentu*. Nitra: SPU, 2007, 119 p. ISBN 978-80-8069-979-6
9. SCHEIN, E. H. 1992. *Organizational Culture and Leadership*. San Francisco: Jossey-Bass Publishers, 1992. 418 p. ISBN: 1-55542-487-2. $25.95
10. STRAUB- BAUER, A. 2005. Knowledge Sharing and Organizational Culture in Multinational Corporatio. [online] In *Sources of Corporate Culture Competitiveness: From Theory to Practice.* [cited 2012-10-10], 2005, p.33 Available on the Internet: http://www.scribd.com/doc/59172891/Corporate-Culture-Competitiveness-the-Danfoss-Universe
11. ŠIGUT, Z. 2004. *Firemní kultura a lidské zdroje*. 1.vyd. Praha: ASPI Publishing, s.r.o., 2004, 88 p. ISBN 80-7357-046-7
12. VYSEKALOVÁ, J.- MIKEŠ, J. 2009. *Image a firemní identita*. Praha: Grada Publishing, 2009. 192 p. ISBN 978-80-247-2790-5
13. URIGA, J. 2011. *Meranie firemnej kultúry – život firmy za oponou dát.* [online] Armstrong Competence Consulting [cited 2012–03–02] Available on the Internet:: <http://www.efocus.sk/kategoria/manager-sk/clanok/meranie-firemnej-kultury-zivot-firmy-za-oponou-dat

# KERNEL HARDNESS AND DOUGH REOLOGICAL INVESTIGATION ON DIFFERENT WHEAT VARIETIES

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## ABSTRACT

The aim of this research was the investigation of winter wheat varieties, the kernel hardness and the dough features. We determined the kernel hardness with two dynamic methods. We measured the parameters of flour. The correlations among hardness index and the examined flour parameters were also significant (r=0.816-0.876). We found strong correlation between the grinding energy ($e_g$) and water absorption (r=0.878) of the flour. Hardness Index – wet gluten (r=0.833), and Hardness Index – water absorption (r=0.876), Hardness Index – P value of alveograph (r=0.816) showed also positive correlations. We found correlation the water absorption and P value of alveograph (r=0.873).

## 1. INTRODUCTION

The kernel hardness has great effect on the baking properties of the resulting flour. Flour, which is made from hard wheat generally have a medium to high protein content and stronger gluten than that, which is made from soft one. The kernel Hardness-locus on chromosome 5D is the main determinant of grain texture in bread wheat. Puroindoline-a (pin-a), puroindoline-b (pin-b) and Grain Softness Protein (GSP) genes are tightly linked at this locus and their products are the predominant components of friabilin, a 15 kDa endosperm protein complex. The friabilin protein complex determines the kernel hardness. Generally, when the amount of the friabilin is high, the kernel hardness is soft reverse (Ácsné, 2001). We can sort the kernel hardness in these two groups. Hardness in wheat is largely controlled by genetic factors but it can be affected by the environment, for example the weather (Gyimes, 2004). The transgenic expression of wild type Pin-a sequence in the Pin-a null genotype gave soft grain with the characteristics of soft wheat including stronger starch bound friabilin. The results of Martin et al (2006) support the hypothesis that both wild type Pin genes need to be present for friabilin formation and soft grain. Vitreousness is also impact to evaluate the Middle-European wheat. The flour of hard wheat with high gluten content generally contains about 12,0-13,0 % (or more) crude protein under Middle-European conditions. The relationship between wheat protein content and kernel texture is usually positive and kernel texture influences the eg during milling. Hard textured wheat grains require more eg than those of soft ones. The aim of our research was to determine the relationships between kernel hardness and other technologically important traits in wheat varieties widely used in the Hungarian agriculture (Véha, 2005.)

## 2. MATERIALS AND METHODS

Registered and widely used seven of HRWW and four of SRWW Hungarian wheat varieties were tested in the study. We used the varieties of Szegedi Gabonatermesztési Kutató Kht. (Cereal Research NPC, Szeged) as samples, which were labeled with code number.

Cleaned grain samples were used to identify the Hardness Index (HI) by SKCS-4100 instrument (Perten Inc.). The SKCS-4100 can complete a test in about 3 minutes, and simultaneously reports mean and standard deviation data for kernel weight, diameter,

and moisture content, as well as the HI. This machine examines 300 whole kernels. (Szabo et al., 2005; Bean et al. 2005)

**Fig. 1. SKCS 4100 instrument (Perten, Inc.)**

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Grain samples were grinded by Perten 3303 for establishing the $e_g$ using a 1-phase output indicator interface. This involves grinding a sample, and sieving a weighed amount (usually 10 g) through a standard screen for a standard time. The percentage of throughs is recorded as the PSI. (Gyimes, Szabo, 2008)


**Fig. 2. Perten 3303 disc mill (Perten, Inc.)**

Moisture content, wet gluten content, farinograph and alveograph tests were determined according to the EU-Standards. Farinograph gave information on the water absorption of the flour. Twin correlations were used to determine the relationship among the various traits; the significant level was 5 %.

## 3. RESULTS AND DISCUSSION

Hardness Indexes and grinding energies ($e_g$) of selected wheat entries in the study (Table 1.).

**Table 1. Hardness Index and $e_g$**

| Entry code | Hardness Index | Grinding Energy (mWh/cm$^2$) |
|---|---|---|
| VI. | 19,6 | 0,21 |
| II. | 27,3 | 0,23 |
| IX. | 28,6 | 0,25 |
| III. | 36,0 | 0,24 |
| VII. | 57,3 | 0,43 |
| IV. | 61,0 | 0,44 |
| VIII. | 67,3 | 0,46 |
| XIII. | 68,3 | 0,47 |
| XII. | 80,6 | 0,53 |
| X. | 80,6 | 0,55 |
| XI. | 81,3 | 0,54 |

The Perten-HI and grinding energy values were showed in Table 1. The SKCS 4100 compartmentalize the results in two groups. Under 50, the samples belong to Soft Wheat-, while samples above values 50 considered as Hard Wheat category. The average HI was 55.2 with minimum of 20 and maximum of 81 values. The II., III., VI. and the IX samples are Soft Wheat, and the other samples are Hard Wheat.

Table 2 and Table 3 show the selected parameters of the sample.

**Table 2. Selected parameters of the samples**

| Class | Entry code | Moisture (%) | Flour yield (%) | Water absorption capacity (ml) | Wet gluten (%) |
|---|---|---|---|---|---|
| S O F T | II. | 13.27 | 71.88 | 54.8 | 21.58 |
| | III. | 13.86 | 71.79 | 57.3 | 27.48 |
| | VI. | 14.01 | 74.01 | 54.0 | 16.85 |
| | IX. | 14.00 | 68.33 | 56.6 | 25.30 |
| H A R D | IV. | 13.90 | 72.89 | 60.9 | 28.13 |
| | VII. | 13.85 | 71.28 | 61.4 | 22.88 |
| | VIII. | 13.58 | 70.16 | 63.2 | 33.68 |
| | X. | 13.37 | 70.96 | 67.9 | 31.70 |
| | XI. | 13.15 | 67.94 | 66.8 | 35.60 |
| | XII. | 12.82 | 70.46 | 63.0 | 29.68 |
| | XIII. | 12.92 | 69.66 | 56.9 | 31.08 |

**Table 3. Results of the Alveograph**

| Class | Entry code | Alveograph | | | |
|---|---|---|---|---|---|
| | | P (mm) | L (mm) | P/L | W (J) |
| S O F T | II. | 42.40 | 65.50 | 0.65 | 102.06 |
| | III. | 63.49 | 93.75 | 0.68 | 204.54 |
| | VI. | 45.72 | 51.50 | 0.89 | 103.99 |
| | IX. | 49.99 | 67.30 | 0.75 | 123.80 |
| H A R D | IV. | 88.25 | 70.00 | 1.26 | 251.35 |
| | VII. | 105.50 | 43.00 | 2.45 | 195.84 |
| | VIII. | 87.95 | 75.50 | 1.14 | 226.64 |
| | X. | 93.18 | 59.90 | 1.56 | 178.48 |
| | XI. | 100.30 | 47.00 | 2.16 | 189.91 |
| | XII. | 103.90 | 61.45 | 1.69 | 252.19 |
| | XIII. | 54.85 | 66.00 | 0.83 | 148.09 |

According to the results, there was a very strong correlation between the grinding energy and the kernel hardness (r=0.991). The correlations among Hardness Index and the examined flour parameters were also significant (r=0.816-0.876). We found strong correlation between the eg and water absorption (r=0.878) of the flour. Hardness Index – wet gluten (r=0.833), and Hardness Index – water absorption (r=0.876), Hardness Index – P value of alveograph (r=0.816) showed also positive correlations. We found correlation the water absorption and P value of alveograph (r=0.873).

## 4. CONCLUSIONS

The aim of the research was to determine the connection among the hardness index, grinding energy and the flour end-use quality parameters. There was a very strong correlation between the grinding energy and the kernel hardness (r=0.991) (Figure 3.). We found correlation between the wet gluten and Hardness Index (r=0.833) of the flour (Figure 4.).

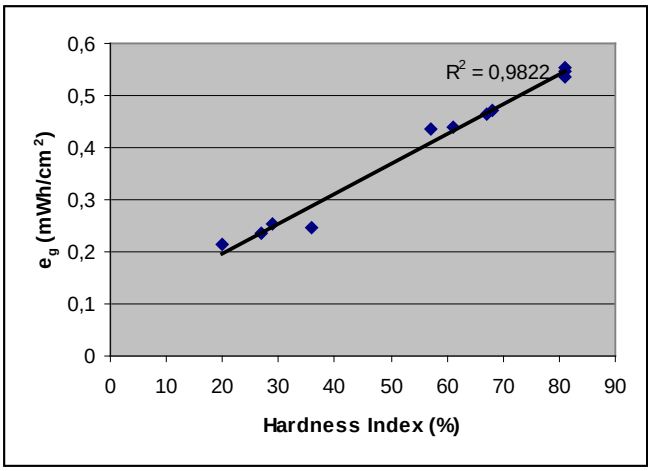


**Fig. 3. Connection between the HI and $e_g$**

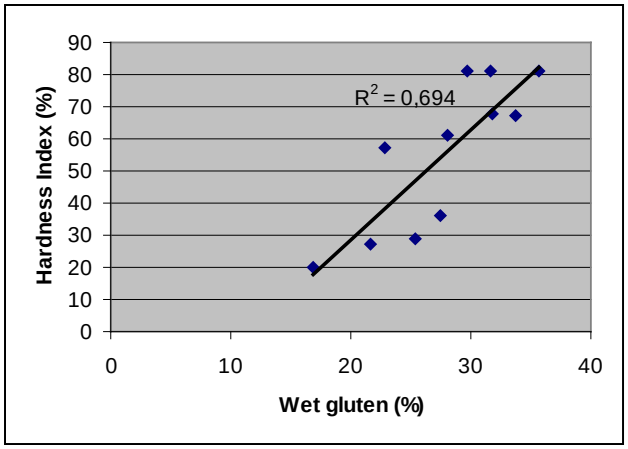


**Fig. 4. Connection between the HI and wet gluten**

The associations were found in this study would help to better understand the technological aspects of wheat and flour quality as well as provide useful information to breeders to develop new, high quality hard or soft wheat varieties.

## REFERENCES

1. Ács Péterné, Matúz János (2001): A szemkeménység mérési módszerének NIR készülékre történő adaptálása és felhasználása szegedi búza genotípusok szelekciójában (abstract in Hungarian), MTA, MÉTE, KÉKI 303. Tudományos Kollokvium 276. füzet, p. 6-7
2. Bean, S. R., Chung, O. K., Tuinstra, M. R., Pedersen, J. F., Erpelding, J. (2005): Evaluation of the Single Kernel Characterization System (SKCS) for Measurement of Sorghum Grain Attributes. USDA-ARS, Cereal Chem. 83(1), p. 108-113.
3. Gyimes, E. (2004): Investigation of Relationship Among the Agro: physical Features of Wheat (Triticum aestivum) Kernel Varieties. PhD Thesys Mosonmagyaróvár (in Hungarian)
4. Gyimes, E., Szabo P. B. (2008): Különféle típusú búzák aprózódási tulajdonságai, MTA AMB K+F Tanácskozás, ISBN 978-963-611-449-7, p. 51. o. (in Hungarian)
5. Martin JM, Meyer F D, Smidansky ED, Wanjugi H, Blechl AE, Giroux MJ. (2006): Complementation of the pina (null) allele with the wild type Pina sequence restores a soft phenotype in transgenic wheat. THEOR. AND APPLIED GENETICS 113: 1563-1570.
6. Szabó P. B., Veha, A., Gyimes, E. (2005): Different Methods for Determining Kernel Hardness, SZTE SZÉF Tudományos Közlemények, p. 42-45, ISSN 1785-3419 (in Hungarian)
7. Véha, A. (2005): Correlation between the kernel-hardness of different endospermium structure bread-wheats and flour quality parameters. Habilitation lectures (in Hungarian)

# BORDER REGION STRUCTURES

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## ABSTRACT

The aim of this analysis is to follow theoretically the way, how a border area becomes an integrated, well-functioning border zone. The definitions and classifications lead up to the concepts of cross-border space generally constructed in the 1990's, in the works of Ratti, Renard or Sanguin. The spatial organization of cross-border regions is generally represented in schematic maps, including more or less objects (border line, rivers, roads, railroads, canals, cities and other settlements, etc.) and flows (capital, labor-power, tourists, migration, etc.). Maps for different border types and levels of cross-border cooperation use different elements and seem not comparable. We summarize these different maps and suggest some modifications and extensions, offering a more general tool for the theoretical analysis. The IT age partially changed the channels of communication; thereby the update of the models is current.

## 1. INTRODUCTION

More and more researchers are interested in borders and grouping them in different ways. Natural borders can be river, mountain, sea or green borders; and the former ones compose obstacles for moving of people and indirectly of commodities. In the European Union, 55% of the land (i.e. not sea) borders are green – without natural obstacle – borders (ESPON 1.1.3. Final Report, 2006), but these borders are also loaded with dissimilarities of ethnicity and as a result of the separation (centrifugal) forces, significant economic disparities are observed (Kotosz, 2004). Instead of looking from a European perspective, we zoom on the strict border area and cross-border regions, and try to analyze space structures at regional level.

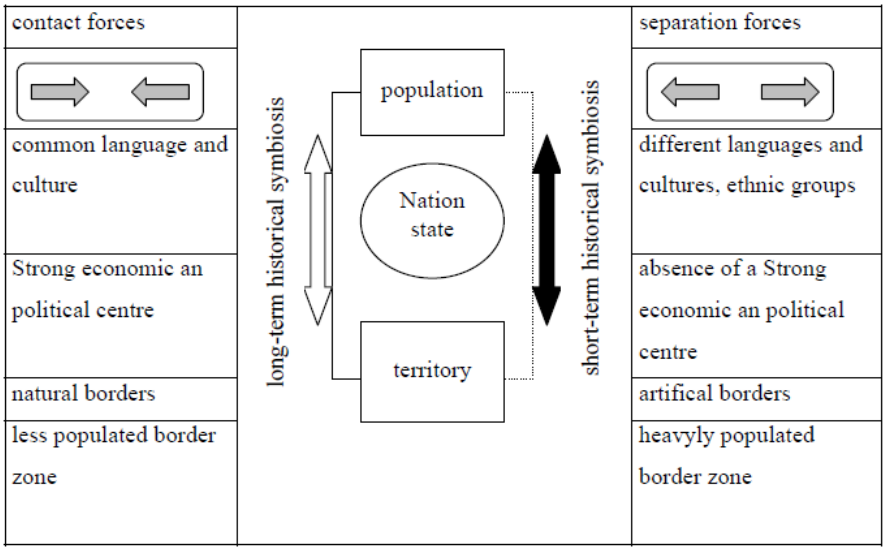


**Fig. 1. The Hartshorne-Haggett model**
Source: Cséfalvay, 1994.

In any analysis of the border regions, one of the keywords is the openness of the border. A special summary of the effects is the Hartshorne-Haggett model. By the Hartshorne adaptation of the Haggett model (Haggett, 1983); in the border region contact (centripetal) and separation (centrifugal) forces act (often simultaneously). Based on

common history, culture, and language, the border areas have more chance to become integrated and create an attractive border region. If the symbiosis of the two population groups is short on both side of the border (without common language, culture), and there is a lack of strong economic center, the territory and the population is not in harmony, the creation a functional border region is quite impossible. In real life, these factors play a role in the creation of a (cross)border region.

As van Houton's figure shows the spatial cognition in the border region, the border has a crucial role in the cognition. The formal knowledge about the other side of the border is less, even if the media and knowledge via personal contacts give some fix points for the cognition (the role and weight of these types of communication has changed in the last decade). In the case of shopping and recreation the border may have a positive effect on the cognition; if quality differences are supposed, the spatial distribution of commerce is distorted. The spatial inequality of services can be explained by their non-traded characteristics. The border cut the personal contacts living on the other side of the border. If we are thinking about a whole border region, it is natural that the personal contacts decrease with the geographical distance, but without borders this decrease is continuous. (see Figure 2).

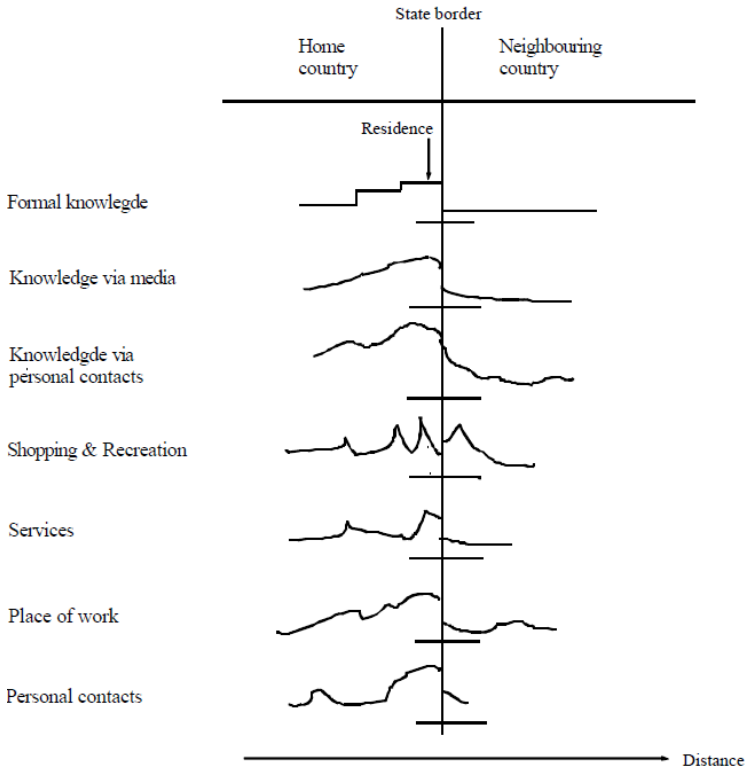


**Fig. 2. Spatial cognition in a border region**
Source: van Houton, 1998

## 2. MATERIAL AND METHODS

The paper is theoretical; we summarize the results of cross-border space mapping. The main focus is on the local and regional level, we use the method of schematic maps. We compare different levels of cross-border cooperation and its impacts on space structure resulting different structure of space.

## 3. RESULTS AND DISCUSSION

The most general schematic overview of cross-border relationships is the figure of Sanguin (see Figure 3). Sanguin underlines the different types of interactions present in the cross-border regional system.

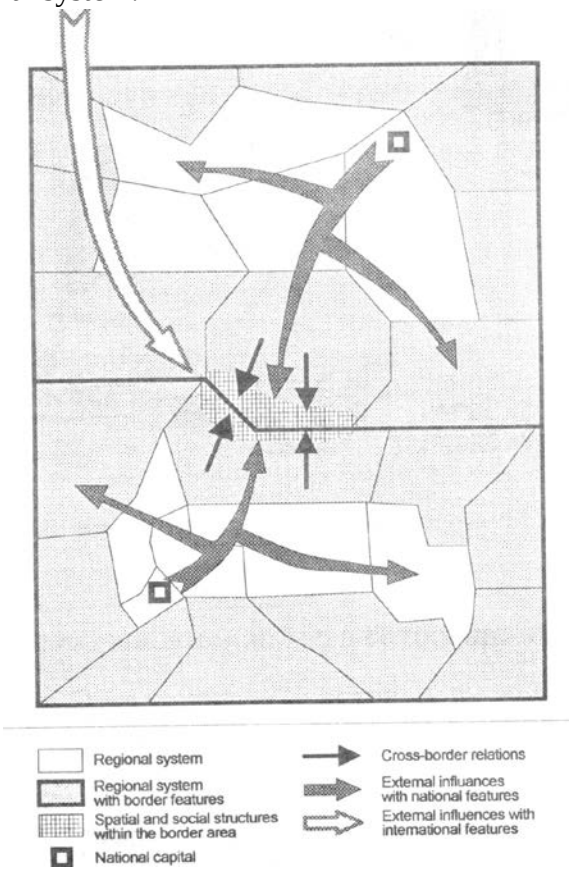


**Fig. 3. Cross-border regional system with intranational and international interactions**
Source: Sanguin, 1995

From his optic, three relations can be distinguished in the border area: the strictly cross-border relations, the external influences with national features and the external influences with international features. In his model, the accent is on forces towards the spatial and social structures within the border area. In some cases, the three different forces can have contradictory goals. The elements of this map are very general and except for the national capital, they are necessary units of such maps.

In the remaining part of the article, our focus will be on the analysis of Jean-Pierre Renard and Patrick Picouet. The French researchers modeled different levels of cross-border cooperation (or from the Hartshorne point of view: variously strong contact and separation forces).

In the first stage, we are at the level of dysfunction of cross-border cooperation with practically closed border (see Figure 4).

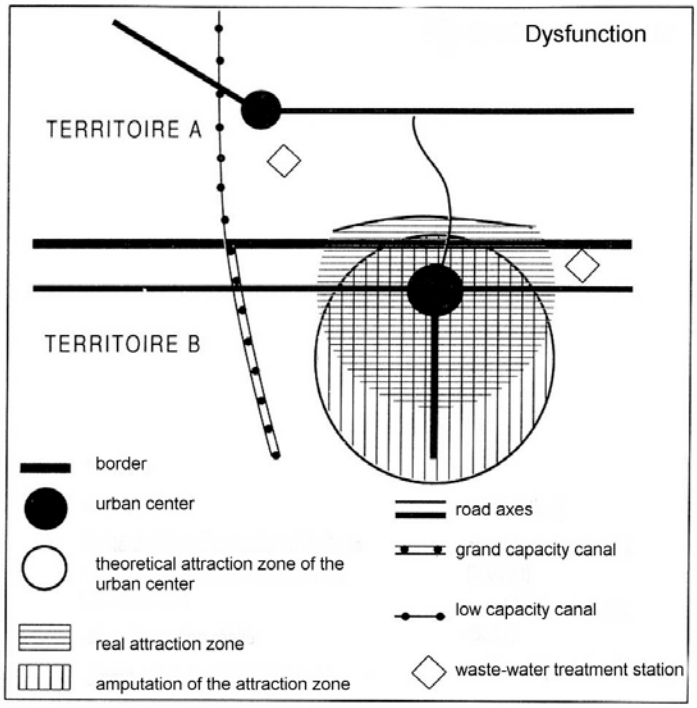


**Fig. 4. Dysfunction of borders**
Source: Renard-Picouet, 1993

In this case the border line *a priori* separates the territory A (less developed) from territory B (more developed). Urban centers are present on both side of the border: the urban center of the territory B situated nearer to the border and attract more man-power; its theoretical attraction zone is mostly on the territory B. The real attraction zone covers partly the theoretical attraction zone and extends to the territory A. However, the urban center of territory B has a great role of the dynamism of this border area. The road axes are partly parallel with the borderline, others conduct into the non borderland area, but the border-crossing possibilities are rare. Every object present on the territory B is closer to the international border (typically border is recognized with more fears on the territory A). However, the objects of this map are the typical targets of the first-stage cross-border cooperation projects: amelioration of traffic channels (roads, canals, maybe railroads) and building common capacity of waste-water treatment.

The next level is a filter-border (see Figure 5) with different level of development (territory A is less developed). On the schematic map we can see that the single urban center of territory A is in recession, the population density near the border area is weak. Around the dynamic urban centers in territory B we can observe the modern phenomenon of peri-urbanisation. On the highly developed territory B, two urban centers are present; the more intensive urbanization magnifies the asymmetry effect of the territory. The cross-border shuttle between the two territories is active; in territory A the unemployment – even with the low density of population – is high. Population of the border region of territory A is fixed because of administrative barriers to move into territory B and the lack of jobs in the home country. The new objects of the map are the cross-border shuttles. When the borders are enough open to realize daily flow of working power, these shuttles appear, even covering a 100 km distance.

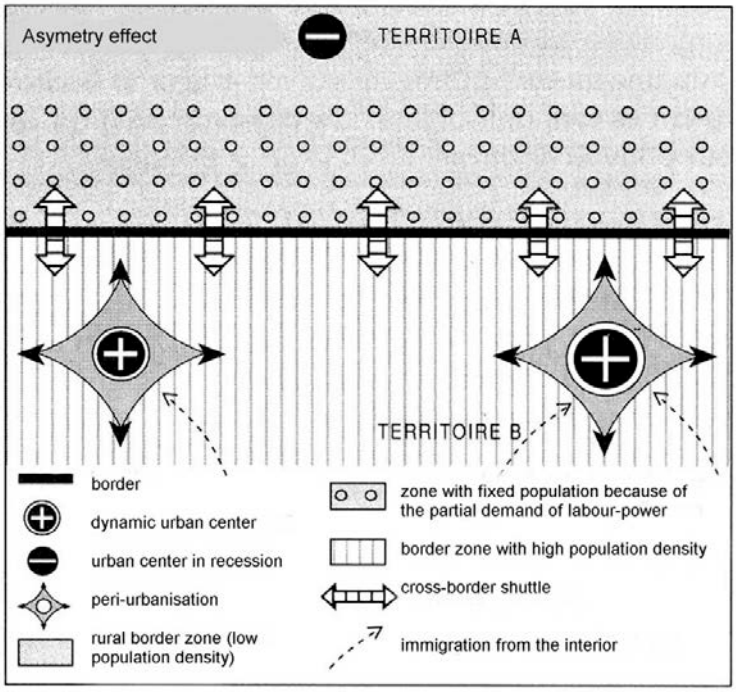


**Fig. 5. Asymmetry of border**
Source: Renard-Picouet, 1993

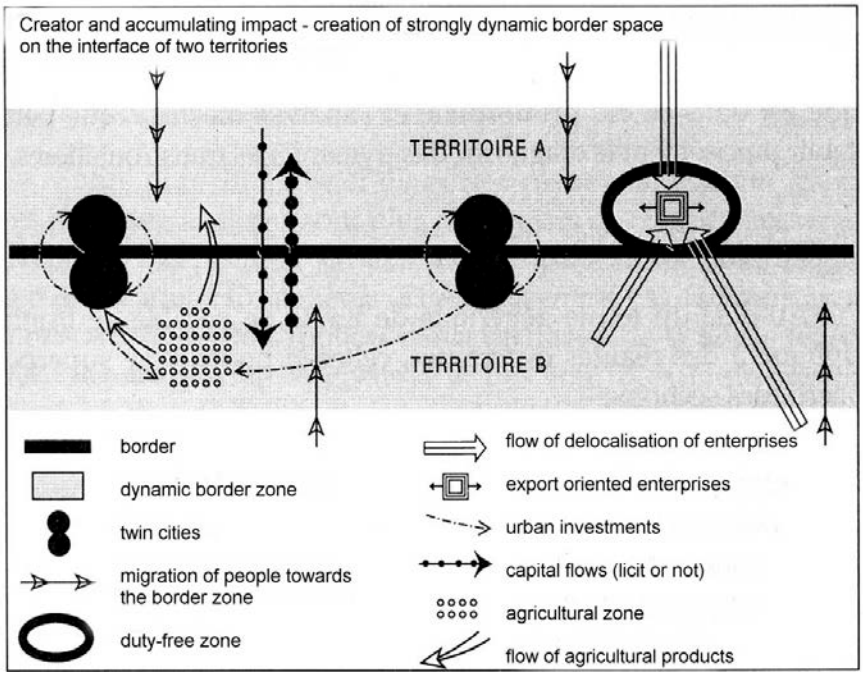


**Fig. 6. Strongly dynamic border space**
Source: Renard-Picouet, 1993

The third level of cross-border cooperation is shown in Figure 6: a strongly dynamic border space on the interface of two territories. In that case the cities are next to each other in the border zone (classical type of twin cities). The cities are quite dynamic on both side of the border because of the flows of people and capital towards the border zone. This dynamism attract the location of export-oriented enterprises, they are installed in duty free zones. The high density population zone neighbors with an agricultural zone helping the alimentation the population. The flow of agricultural

products concern both side of the border. Level of development is similarly high on both sides of the border, but physical proximity of actors (cities, enterprises) is important in the cooperation. The integration reached the level where investments are bilateral, production is specialized, but balanced. The new objects of the maps are agricultural zones (until this phase, both countries had their own local agriculture), and the duty-free zone with industrial parks. The border should be open to have the possibilities of moving capacities of enterprises into these parks. At this level, the infrastructure is supposed to be complete; the balanced level of employment does not require a large volume of daily commuting.

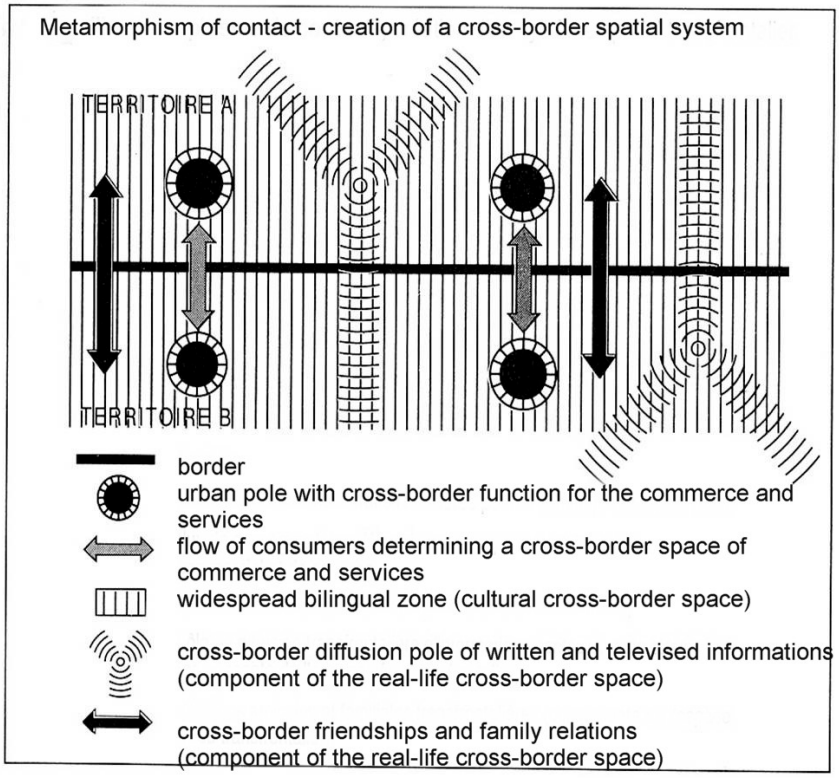


**Fig. 7. Metamorphism of contact**
Source: Renard-Picouet, 1993

This is the most integrated territory, where the border lost completely its function. The border such as a landmark is yet present, but from the contact point of view the border is imperceptible. This border zone is a widespread bilingual zone without obstacle before the commerce, the services and the personal contacts. The urban poles are situated in the border area; between them the flow of consumers and services is high. The cross-border diffusion poles assure a good base of cooperation between the territory A and territory B. The family relations and cross-border friendships are also strengthened in that integrated cross-border region. This map is perfectly symmetrical; the most important new elements are the cross-border information sources (supposing bilingual population on both sides of the border). Nowadays, the importance of televised and mainly written information is decreasing, while the role of internet and common web sites are increasing. The communication networks respin the invisible background spatial structure. The vertical lines of the border zone should be replaced by an uneven, apparently random system.

## 4. CONCLUSION

We can see that only a very high level of social and economic integration can decrease the separation effect of borders. The common language (or perfectly bilingual zone), the fully integrated economic functions and the same living standard are necessary conditions of disappearing of cross-border infrastructure problems. Even in Europe, we can find a few examples, the metropolis of Lille (with a cross-border region in Belgium) and the triborder zone of Luxembourg-Belgium-France. Eastern European border zones deals with problems of first or second phase, having examples of the third phase in the border zones of the ex-Iron Curtain. Future researches can be done on overseas locations with different static and dynamic features.

## REFERENCES

1. Cséfalvay, Z. (1994): A modern társadalomföldrajz kézikönyve. IKVA, Budapest.
2. Haggett, P. (1983): Geographie. Eine moderne synthese, Harper&Row, New York.
3. Kotosz, B. (2005): Are Borders Fault-Lines in Growth Performance? Region and Regionalism, n$^{o}$ 7, vol. 1, pp. 169-178.
4. Picouet, P. – Renard, J-P. (1993): Frontières et territoires. Documentation française, Paris.
5. Ratti, R. (1993): Spatial and Economic Effects of Frontiers, in Theory and Practice of Transborder Cooperation, R. Ratti - S. Reicmann (eds), Helbling & Lichtenhahn Verlag, Basel-Frankfurt am Main.
6. Sanguin, A-L. (1995): The Disappearance of Boundaries in the European Union: from Cross-border Regions to Euroregions, in: Region and Regionalism, Social and Political Aspects (Koter M. ed) pp. 29-34., Opole-Łódź.
7. Van Houton, H. (1998): The development of cross-border economic relations. ThelaThesis Publisher, Amsterdam.

# THE RULES FOR THE CASH FLOW STATEMENT IN THE INTERNATIONAL FINANCIAL REPORTING STANDARD

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## ABSTARCT

Cash flow statement may provide considerable information about what is really happening in a business beyond that contained in either the income statement or the balance sheet. Analyzing this statement should not present an intimidating task; instead it will quickly become obvious that the benefits of understanding the sources and uses of a company's cash far outweigh the costs of undertaking some very straightforward analyses. The objective of IAS 7 is to require the presentation of information about the historical changes in cash and cash equivalents of an entity by means of a statement of cash flows, which classifies cash flows during the period according to operating, investing, and financing activities.

### Those who cares about a Cash Flow Statement?

- Executives want to know if the cash generated by the company will be sufficient to fund their expansion strategy
- Stockholders want to know if the firm is generating enough cash to pay dividends
- Suppliers want to know if their customers will be able to pay if offered credit
- Investors want to evaluate future growth potential
- Employees are interested in the overall viability of their employer as indicated by its ability to fund its operations

### Format of the Cash Flow Statement

The cash flow statement is divided into three sections:
*Cash flow from operating activities:* shows the results of cash inflows and outflows related to the fundamental operations of the basic line or lines of business in which the company engages. (Example: cash receipts from the sale of goods or services and cash outflows for purchasing inventory and paying rent and taxes.)
*Cash flow from investing activities:* associated with purchases and sales of non-current assets (Example: building and equipment purchases or sales of investments or subsidiaries.)
*Cash flow from financing activities:* associated with financing the firm (Example: selling and paying off bonds and issuing stock and paying dividends)

The three categories of activities - operating activities, investing activities and financing activities - generating inflows and outflows of cash are presented in the exhibit below.

**Table 1. Cash in process**

| *Cash received from operating activities* | *Cash received from investing activities* | *Cash received from financing activities* |
|---|---|---|
| | *INFLOWS* | |
| | *Cash and cash equivalents* | |
| | *OUTFLOWS* | |
| *Cash paid for operating activities* | *Cash paid for investing activities* | *Cash paid for financing activities* |

Source: author's edition

The International Financial Reporting Standard (IFRS) in IAS 7 gives the rules how a company has to provide the cash flow statement on a standardized way for the users.

**Fundamental Principle in IAS 7**

All entities that prepare financial statements in conformity with IFRS are required to present a statement of cash flows.

The statement of cash flows analyses changes in cash and cash equivalents during a period. Cash and cash equivalents comprise cash on hand and demand deposits, together with short-term, highly liquid investments that are readily convertible to a known amount of cash and that are subject to an insignificant risk of changes in value. Guidance notes indicate that an investment normally meets the definition of a cash equivalent when it has a maturity of three months or less from the date of acquisition. Equity investments are normally excluded, unless they are in substance a cash equivalent (e.g. preferred shares acquired within three months of their specified redemption date). Bank overdrafts which are repayable on demand and which form an integral part of an entity's cash management are also included as a component of cash and cash equivalents.

Presentation of the Statement of Cash Flows

Cash flows must be analyzed between operating, investing and financing activities.

Key principles specified by IAS 7 for the preparation of a statement of cash flows are as follows:

*Operating activities* are the main revenue-producing activities of the entity that are not investing or financing activities, so operating cash flows include cash received from customers and cash paid to suppliers and employees. Operating activities are the principal revenue-producing activities of the entity and other activities that are not investing or financing activities. Cash flows from operating activities are primarily derived from the principal revenue-producing activities of the entity. Therefore, they generally result from the transactions and other events that enter into the determination of profit or loss.

The amount of cash flows arising from operating activities is a key indicator of the extent to which the operations of the entity have generated sufficient cash flows to repay loans, maintain the operating capability of the entity, pay dividends and make new investments without recourse to external sources of financing.

*Investing activities* are the acquisition and disposal of long-term assets and other investments that are not considered to be cash equivalents. Investing activities are the acquisition and disposal of long-term assets and other investments not included in cash equivalents. The separate disclosure of cash flows arising from investing activities is important because the cash flows represent the extent to which expenditures have been made for resources intended to generate future income and cash flows.

The aggregate cash flows arising from obtaining and losing control of subsidiaries or other businesses shall be presented separately and classified as investing activities.

*Financing activities* are activities that alter the equity capital and borrowing structure of the entity. Financing activities are activities that result in changes in the size and composition of the contributed equity and borrowings of the entity. The separate disclosure of cash flows arising from financing activities is important because it is useful in predicting claims on future cash flows by providers of capital to the entity.

An entity shall report separately major classes of gross cash receipts and gross cash payments arising from investing and financing activities.

The main aim of cash flow is to deal with the so called non-cash transactions. In that case investing and financing transactions that do not require the use of cash or cash equivalents shall be excluded from a statement of cash flows. Such transactions shall be disclosed elsewhere in the financial statements in a way that provides all the relevant information about these investing and financing activities.

Cash flows arising from transactions in a foreign currency shall be recorded in an entity's functional currency by applying to the foreign currency amount the exchange rate between the functional currency and the foreign currency at the date of the cash flow.

The cash flows of a foreign subsidiary shall be translated at the exchange rates between the functional currency and the foreign currency at the dates of the cash flows.

Unrealized gains and losses arising from changes in foreign currency exchange rates are not cash flows. However, the effect of exchange rate changes on cash and cash equivalents held or due in a foreign currency is reported in the statement of cash flows in order to reconcile cash and cash equivalents at the beginning and the end of the period as realized gains or losses.

**The Hungarian standard for Cash Flow statement**

The Hungarian rules for cash flow statement keeps the order of the international rules. It is laid down in Act on Accounting Appendix 7. giving the method for the presentation of cash flow statement, which is compulsory to prepare for those entrepreneurs whose financial report is the so called annual financial report.

## REFERENCES

1. Fundamental Analysis: The Cash Flow Statement , Ben McClure , Investopedia 2012
2. Walter, T. Harrison jr., Charles, T. Horngren, *Financial Accounting Second Edition,* New Jersey,Prentice Hall Englewood Cliffs
3. Act on Accounting year 2000 - C

# SOME ASPECT OF CONSUMERS' HABIT BY FERMENTED MILK PRODUCTS

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## ABSTRACT

In our modern word everybody rush and has not got enough time for him/herself. The role of the nutrition has changed. It does not mean the quiet action, it means a snatching. So people like foods which not only beguile hunger, but save the health. The functional food looks like this meal. In our work we used questionnaire, and then we analysed the habits of the consumers related to the fermented milk products. Moreover, we made structured interview with 3 experts.

**Keywords:** healthy food, probiotic, consumers' habits

## 1. INTRODUCTION

Nowadays the enterprises emphasize the production of the products which are connecting to the health-preservation. Because of the growing of the demand, more and more factories appear functional food. They are not only against the hunger, they have another function too, protect the human health. The most known of them are the probiotic products. In our country not too big the number of the healthy – conscious consumer, so the role of the media is important to change the habits (Szakály et al, 1997).

The probiotic means the all human-friendly bacterium, which has good effect for the health of the owner. The probiotic are all *lactic acid* and *bifidobacterium*. The most famous of them the *Lactobacillus* and the *Streptococcus* clan. They are different from the common lactic acid bacterium, because they can survive the effort of the acid in the stomach. So they can get to the large intestine, where they can multiply and to stick its wall. In the dairy products the number of this bacterium should be $10^8$/g. The best products for this probiotic are: the fermented milk products, as cottage cheese, cheese, butter, butter-like products, ripened cheese (Fondén et al, 1999, Hawrelak, 2002).

Why these bacteria healthy for us?

- They are produce ß-galactosidase, so people who suffer from lactose-intolerance can eat yogurt,
- They can digest the big part of cholesterol of milk,
- They are protected against the colon-cancer (Szakály, 2001).

## 2. MEANS AND METHODS

In our work we made a qualitative and quantitative research as well. We interviewed 3 experts, who had valuable knowledge related to the probiotic milk products. The 3 experts were:

1. a manager of a mercantile trade (Pribomeat),
2. a regional manager of a dairy firm
3. a manager of a TESCO market (in Budapest)

After the structures interviews we collected the main questions, and made questionnaire. This questionnaire was uploaded to Internet, so the answerers could fill by electronic way. We touched 3 main themes

- the habits of the purchasing
- the buying of the healthy food
- the influence factors of the purchasing.

## 3. RESULTS

The main thought of the 3 interview are the follows. The interviewed experts were agreed in these opinions:

- The main information-source of the Hungarian people the media, especially the advertisement on TV. They see a food and they try it. Healthy foods are important only for sick consumer. The most important factors for the people were: the price, the convenience, the actions and the fresh product.
- The market of the probiotic milk products is in decreasing, but the experts hope that this trend will change, because of the fear from the illness, and the increasing of the healthy–conscious consumer. The traded amount of mentioned probiotic yogurt (Activia) – in the Pribomeat is presented on the table 1. Because of the decline the Tesco droop the choice of this product, it keep only the economic items.
- The role of the marketing is very important, because people want to know the reasons, why they need to eat this kind of product. The second important factor is the increase of the solvent demand. We have to sell our product for less and less consumer. Not only the ATL tools are important but to use of the BTL tools are also important.

**Table 1. The traded quantities of probiotics yoghurts (Danone Activia) in the Pribomeat (cup)**

Source: Pribomeat Ltd.

| Year | Number |
|---|---|
| 2007 | 175179 |
| 2008 | 238712 |
| 2009 | 250324 |
| 2010 | 231895 |

We asked 100 people during the qualitative research. From these people there were 43 women and 57 men; the average age was 33,4 years. The economic status of asked consumers was different. 26% from all the asked people had income than the average, 58% of them had less than the average and 16% of them had more income than the average. The average net income was 140.000 Ft in Hungary in 2011 (www.hvg.hu))
In the next part we show some questions and answers.
The first question is: "how important is the healthy nutrition for you?" The answer is demonstrated on fig. 1.

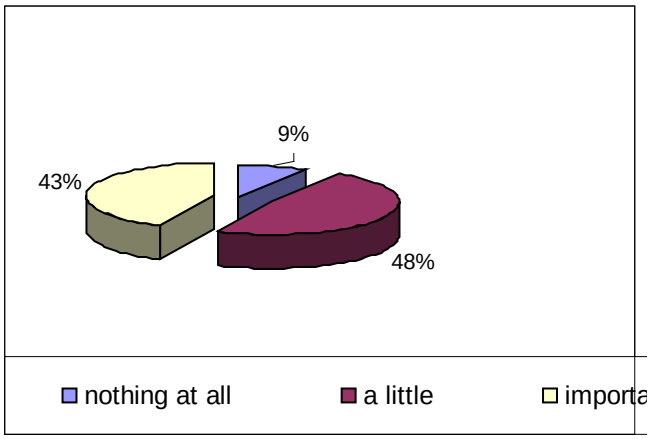


**Fig. 1. The division of the answerers by the importance of the healthy nutrition (n=100)**

As we can see, the most people (48%) think a little about the healthy nutrition. Sometimes they eat healthy food (fruit, vegetables and dairy-product) but often eat what they like. This theme was important for 43% of asked people. They care about their food (they are woman between 25-40 years old), and only 9% of them said they do not matter with it. They are usually 18-25 years old men. It is good news for the dairies, because there is a part of the consumers who can be a potential consumer.
The next question is about the frequency of purchasing of healthy foods (fig. 2.) The answers support the previous ones, as the most of people (36%) only weekly buy healthy foods. However only 9 people from the all said that the healthy nutrition is no aim for them, but this answer is not really true. They are more than double of who rarely buy healthy food.

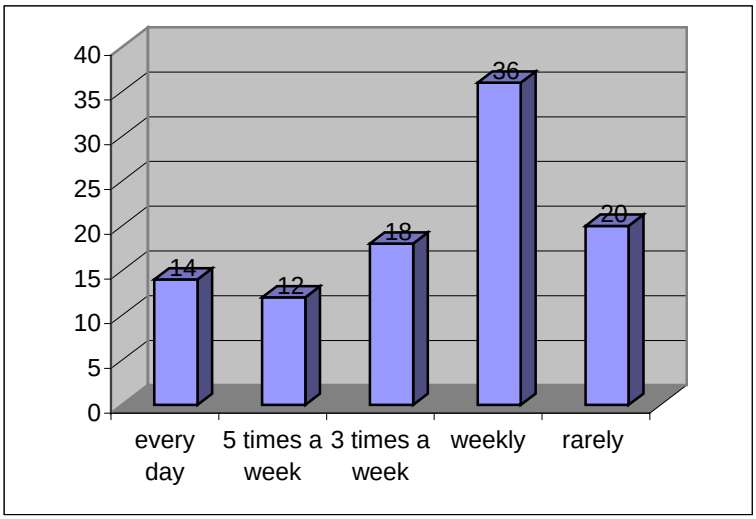


**Fig. 2. The division of the answerers by the frequency of the healthy food-purchasing (n=100, %)**

Sometimes the reason of the rarely purchasing is the poverty. Healthy foods are more expensive than the mass-produced (for example premium ham, or TESCO economic wiener). So we was wondered, if buyer had more money they would purchase more healthy food. The answers are shown on the 2nd table.

**Table 2. The division of the answerers by the opinion of purchasing – if they have possibility (n=100)**

| Opinions | Sharing (%) |
|---|---|
| Yes | 40 |
| No | 23 |
| Maybe | 37 |

We can see, 40% of them think, healthier food should be bought. They are from the group who answered "weekly". People who said "rarely" stood to their opinion.
In the following question we asked consumers about their general purchasing habits. They had to range from 1 to 4 the following factors: price, packaging, local product, brand, advertisement, taste, quality and other people' advice. On the figure 3 we can control ourselves, so we can see what kind of factor is the most important (for the asked people, and what our opinion is).
The most average is for the taste, close to it the quality. The price is again in the 3rd place. We have to notice, that our measuring was not representative. In Hungary – unfortunately – the most important factor is the price of foods.) The packaging and the advertisement are not important for the consumers. However we know that dairy firms spend a lot of millions for the advertisements and nice packaging.

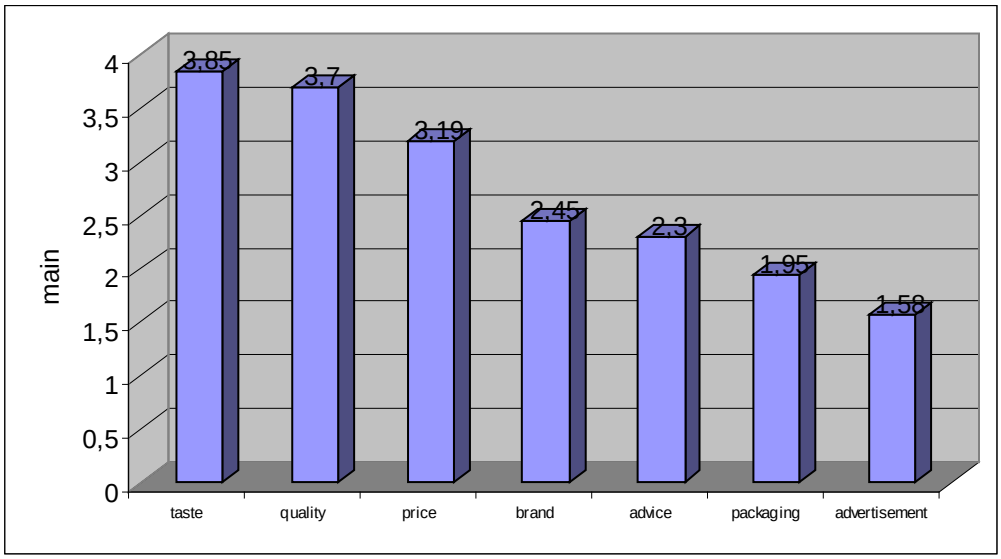


**Fig. 3. The average points of the factors - influence the purchasing (n=100)**

The other question is about the purchasing of special milk products. The answerers could tell me they usually buy yogurt, kefyr and sour cream or not. The frequency can be read from Figure 4. We can see the yogurt and the sour cream is important for the people, 37% of them buy these products. Kefyr hasn't got important role, it has a special taste, and so only every 10th answerer purchase it. The people who buy yogurt are mainly woman, aged 25-40. We can find out, that there was big part from answerers who should be a potential yogurt-buyer. Furthermore, – of course – not only those people eat yogurt that do the shopping, but woman usually buy for their husband, and for their children too.

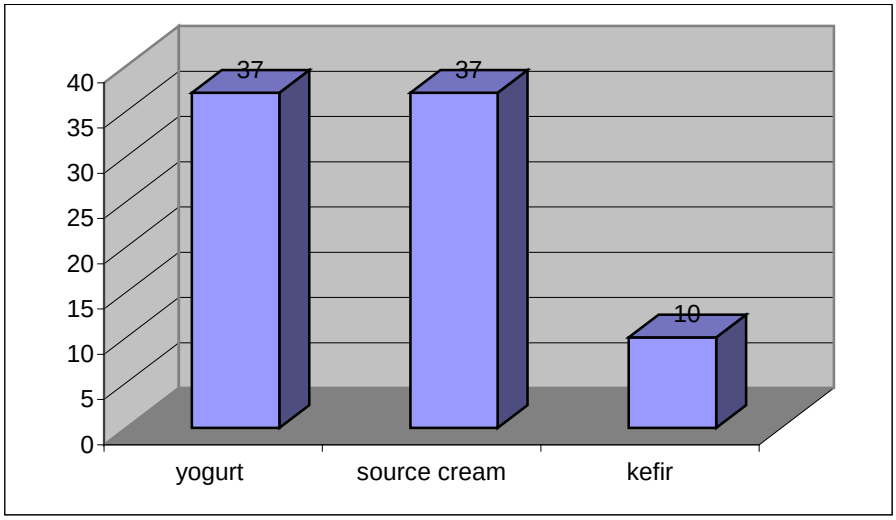


**Fig. 4. The division of the answerers by the purchasing of special dairy product (n= 100, %)**

At last we were looking for the answer for the reason of the purchasing of special milk product. We set out some factors (taste, price, health) and people had to choice one of them. The results are presented on the table 3. As we can see, the most important factor was the taste of the product for the half of the questionnaire-filler person. We think that it is normal result, because we will eat the selected item with good taste. Good thing is the 2nd important factor; people (26%) were thinking from products as healthy foods. The price is only on the 3rd place.The mission is clear: to ensure the remaining consumers, to aware of the importance of healthy food.

**Table 3. The most important reason of the purchasing of the special milk product (n=100)**

| ***The reasons*** | ***%*** |
|---|---|
| The taste of the product | 49 |
| I think it's a healthy product | 26 |
| The price of the product | 15 |
| Other | 10 |

## 4. SUMMARY

In our examination we made a qualitative and quantitative research too. Our aim was to take an analysis about the situation of probiotic milk product, and to know the consumers' habits. Our main results are:

- The market of this product is decreasing,
- The most important factor for people the price and the convince (by interview)
- The number of sold yogurts is dropped,
- Healthy nutrition is not too important for the most part of the answered people ,
- The taste, the quality and the price of foods were the most important factors in the choice of customers.
- Advertising is not an important factor in purchasing, as opposed to the opinion of experts.

## REFERENCES

1. Fondén, R., Mogensen, G., Tanaka, R., Salminen, S. (1999): Effect of culture-containing dairy products on intestinal microflora, human nutrition and health. Supplement IDF F Doc 294, 3-62
2. Hawrelak, J. (2002): Probiotics: Are supplements really better than yogurt? Journal of Australian Traditional Medicine Society 8 (1) pp. 11-23
3. Szakály S. (2001): Topic report Laboratory and physiological human clinical examination of the physiological effects of HunCult® probiotic fermented milk drink. MTKI Kutatási Tanulmány, Pécs pp. 1-17.
4. Szakály Z., Berke Sz., Szakály S., Széles Gy.: Funkcionális élelmiszerek - új piaci trend és kihívás a tejtermékgyártók számára. Vállalati környezet és alkalmazkodás az élelmiszertermelésben – Jubileumi konferencia a GTK megalakulásának 10. évfordulójára. GATE, Gazdaság-és Társadalom-tudományi Kar, Gödöllõ, 1997.okt. 9-10.
5. http://hvg.hu/gazdasag/20110927_nott_netto_atlagkereset

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